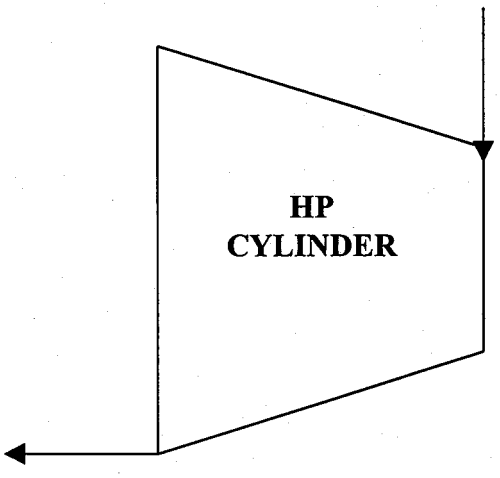
INTERMOUNTAIN GENERATING STATION UNITS 1 & 2

HP TURBINE RETROFIT

THRUST

- **INTERNALLY BALANCED**



Blading Thrust ←

Disc Thrust ←

Dimensional Thrust →

INTERMOUNTAIN GENERATING STATION UNITS 1 & 2

HP TURBINE RETROFIT

HEAT BALANCE DIAGRAMS

TO BE PROVIDED BY ALSTOM

VWO LOAD

1% Make Up

Condenser Pressures
A: 2.99 ins Hg
B: 2.24 ins Hg
C: 1.66 ins Hg

BFPT Exhaust Pressures
0.8psia
1.5psia

ADDITIONAL LOADS ?

75% VWO Load
50% VWO Load
25% VWO Load

INTERMOUNTAIN GENERATING STATION UNITS 1 & 2

HP TURBINE RETROFIT

THERMAL KIT

TO BE PROVIDED BY ALSTOM

HP Balance Gland Leakage
versus Throttle Flow

HP Inlet Pressure
versus Flow

HP Extraction Stage Shell Pressure
versus Flow to Following Stage

Net Heat Rate
versus Load

HP Turbine Efficiency Including Valves
versus Throttle Flow Ratio

HP ELEP
versus Intercept Valve Pressure

Introduction

to

Turbine

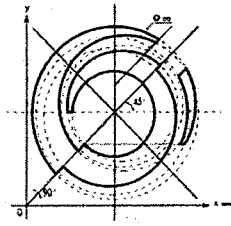
Engineering

17th May 2001

Intermountain Design Review
Introduction to Turbine Engineering

T.Shurrock

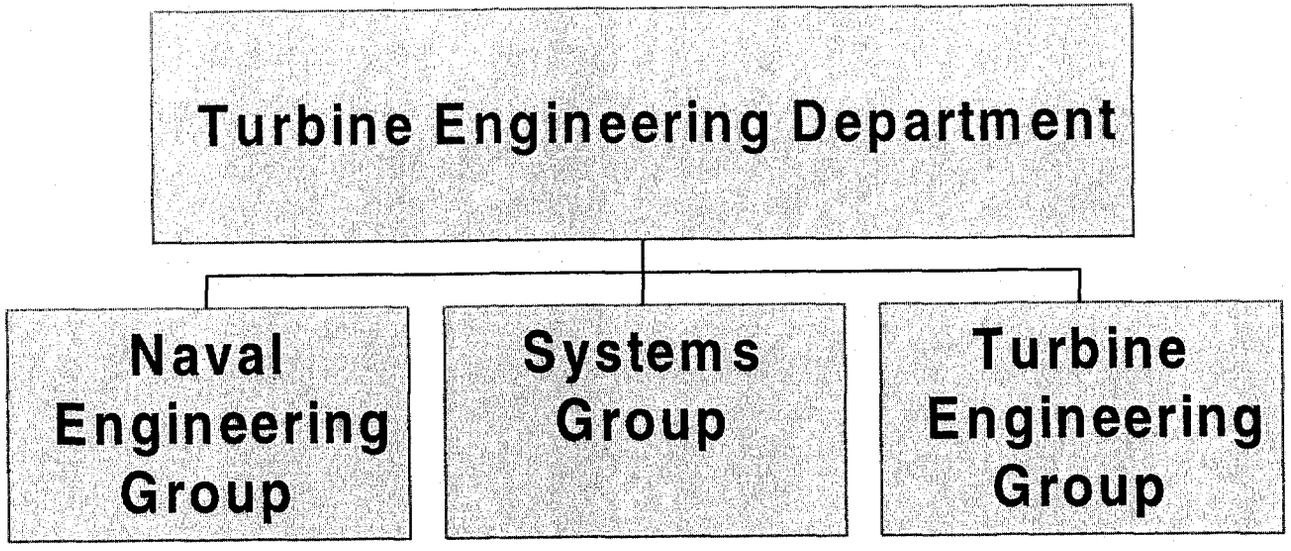
ALSTOM

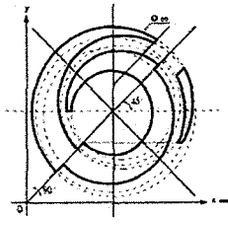


Introduction

ALSTOM

- Turbine Engineering
- TEG Functional Organisation
- TEG Project Design Team
- Design Experience
- Engineering Culture
- Advanced Design Tools


Turbine Engineering Department
Naval Engineering Group
Systems Group
Turbine Engineering Group



Turbine Engineering Group
Areas of Responsibility

ALSTOM

Impulse Technology Centre within ALSTOM
New and Retrofit Design of large turbines

Analysis, layout design, detail design and production of manufacturing drawings & specifications

Development of Components, Methods & Processes

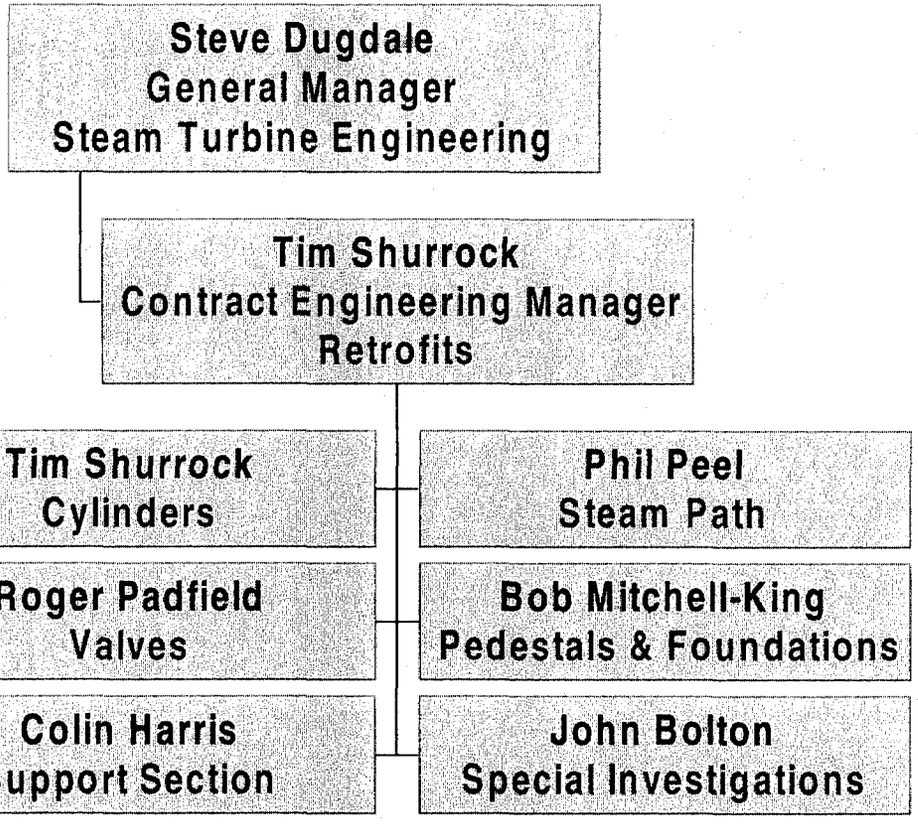
Contract Design customisation

Design Project Management

Support for: Concept design
Manufacturing
Tendering
Site

TEG Retrofit Organisation

ALSTOM



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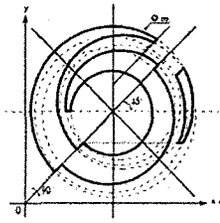


Turbine Engineering
Intermountain Project Design Team

ALSTOM

Dedicated Core Team for the project:

Richard Plant - Senior Engineer
(Design Project Manager & Cylinder Analysis)

Rob Cunningham - Senior Engineer
(Cylinder Layout)

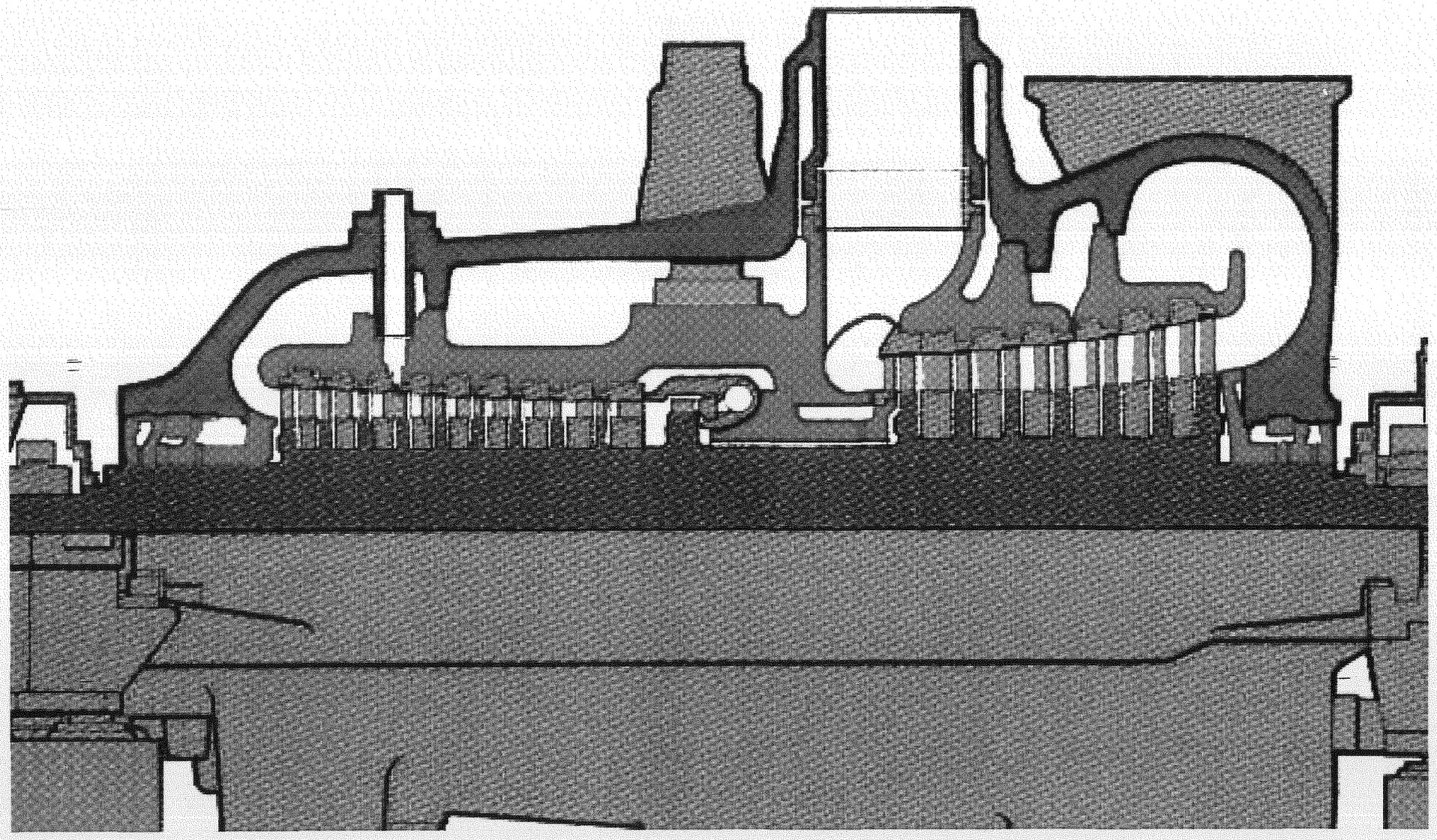
Howard Warrener - Engineer
(Steam Path Analysis)

Bryan Palmer - Layout Technician
(Steam Path Layout)

IP7_006141

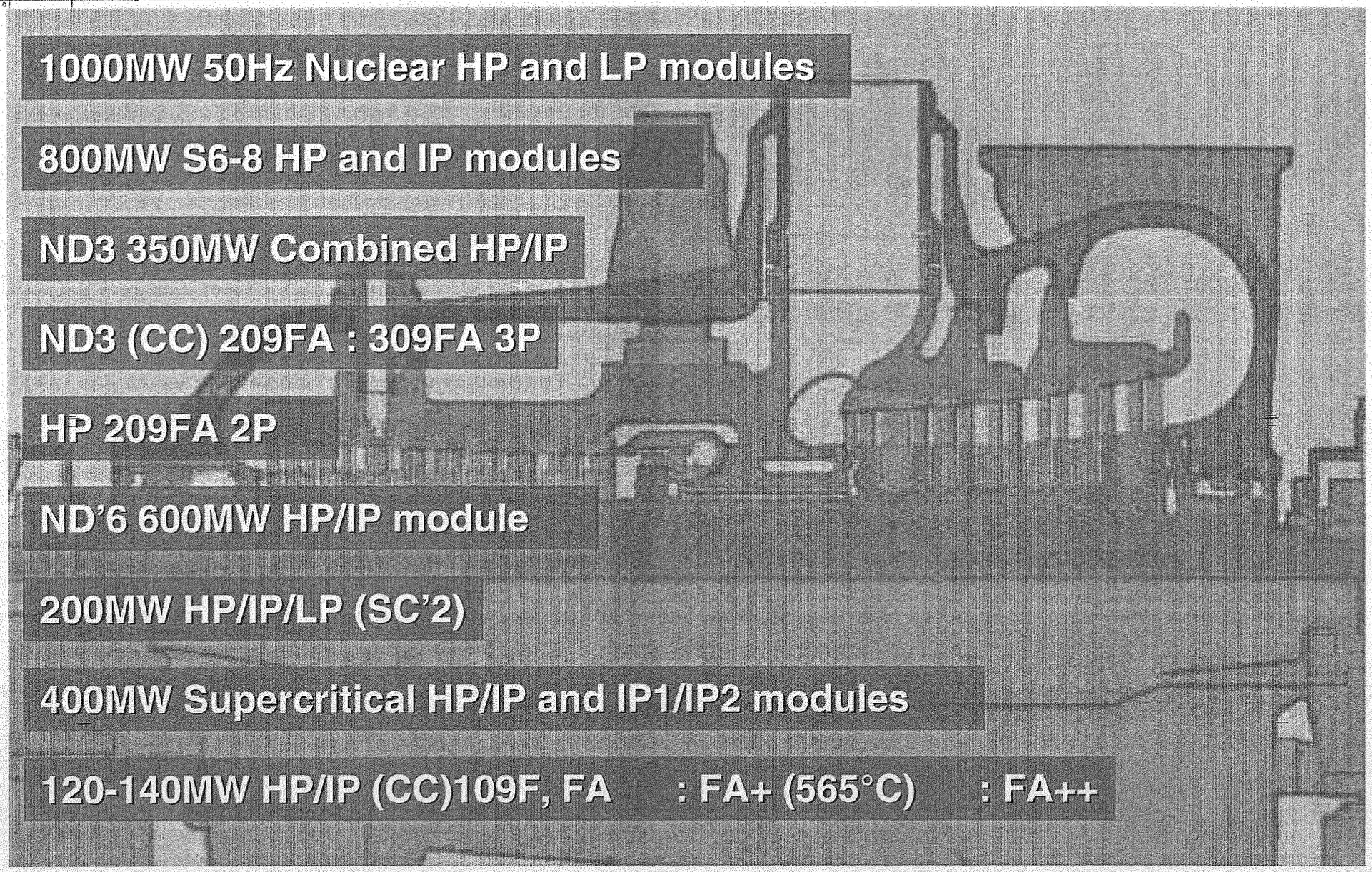
TEG 1990's Reference List

ALSTOM



TEG 1990's Reference List
New Module Development

ALSTOM



- 1000MW 50Hz Nuclear HP and LP modules
- 800MW S6-8 HP and IP modules
- ND3 350MW Combined HP/IP
- ND3 (CC) 209FA : 309FA 3P
- HP 209FA 2P
- ND'6 600MW HP/IP module
- 200MW HP/IP/LP (SC'2)
- 400MW Supercritical HP/IP and IP1/IP2 modules
- 120-140MW HP/IP (CC)109F, FA : FA+ (565°C) : FA++

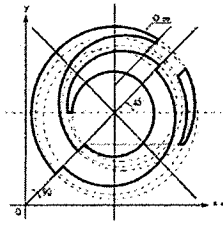
IP7_006143

TEG 1990's Reference List

Retrofit Module Development

ALSTOM

- 1200MW San Onofre LP retrofit
- 3H's 660MW HP and IP modules
- GE G5 700MW Supecritical HP/IP (Marshall)
- GE G3 750MW HP's Miller/Crystal River/Paradise/Sherco
- GE G3D 750 MW Supercritical HP's Montour/Brunner Is/Moss Landing/Monticello
- LD66 (37.2") LP retrofits (various configurations)
- 600MW Westinghouse BB44 HP/IP Modules for Labadie/Rush Is
- 1100MW Westinghouse BB22 (Supercrit) Belews Creek HP and IP



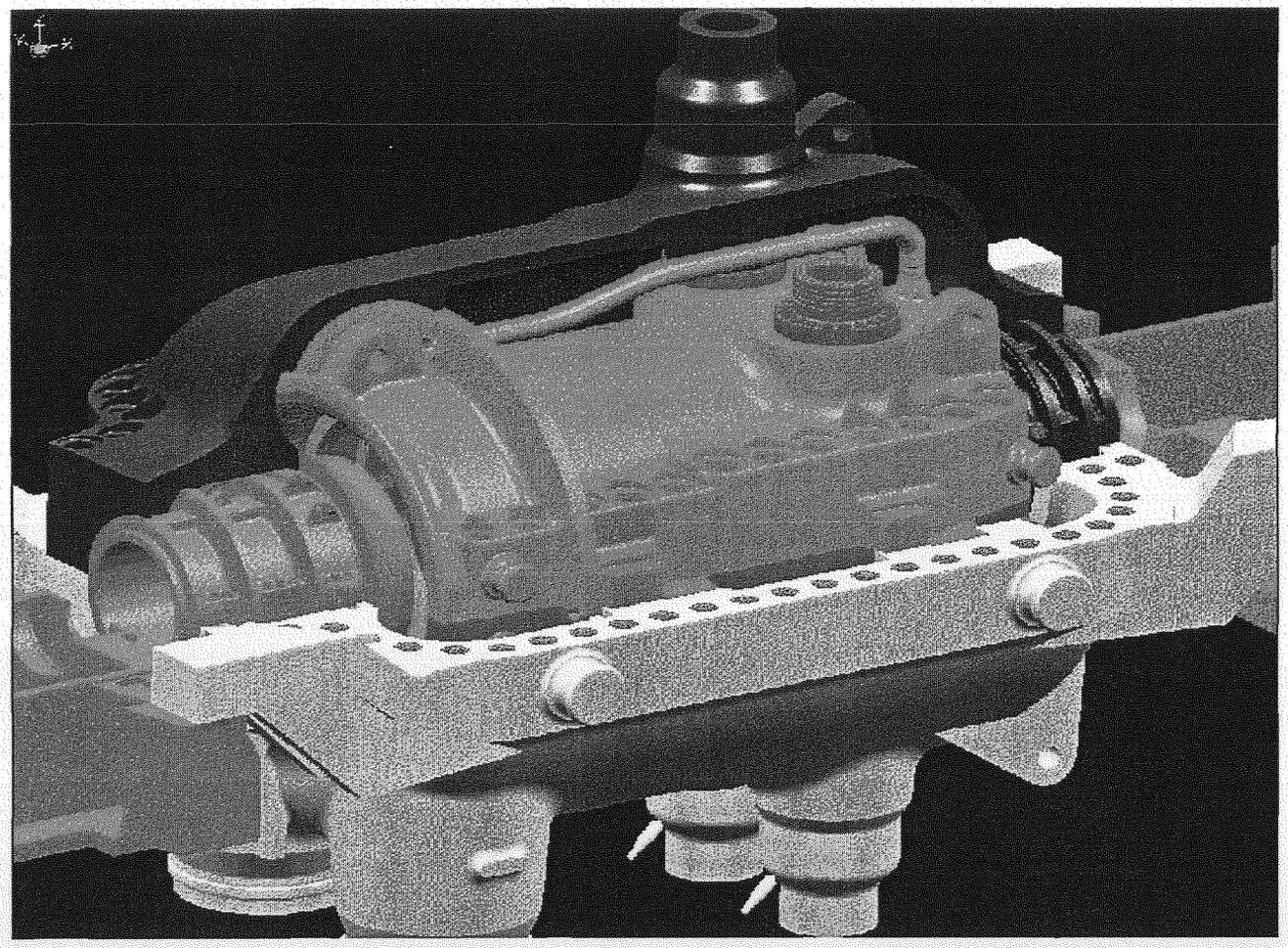
Turbine Engineering
Our Culture

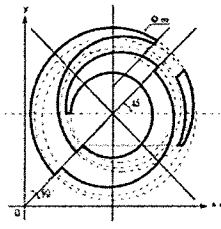
ALSTOM

- Stable highly motivated design team
- Co-located multiskilled staff
- Design Review (Right first time)
- Attention to detail
  Standard design features (Product Reliability)
  Experience feedback
- Self critical approach (Total Quality)
- Empowerment (Ownership / Commitment)
- Continuous Improvement (Process / Skills / Product)
- Good Communication
- Strong teamworking (including Customer / Supplier)

Advanced Design Tools

ALSTOM

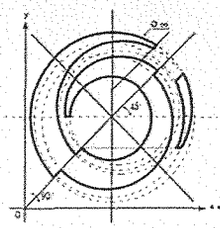




Advanced Design Tools

ALSTOM

- CATIA (CAD) SYSTEM
  - 3-D modelling for component design
  - Excellent visualisation avoids errors
  - Electronic output direct to suppliers, factory
- Rotor Design Suite - interactive package for analysis of steam path and rotor components
- Casing and Bolting Design Suite
  - integrated with CAD system
- Shaftline Analysis Suite
- Advanced 3D Finite Element analysis



Advanced Design Tools

ALSTOM

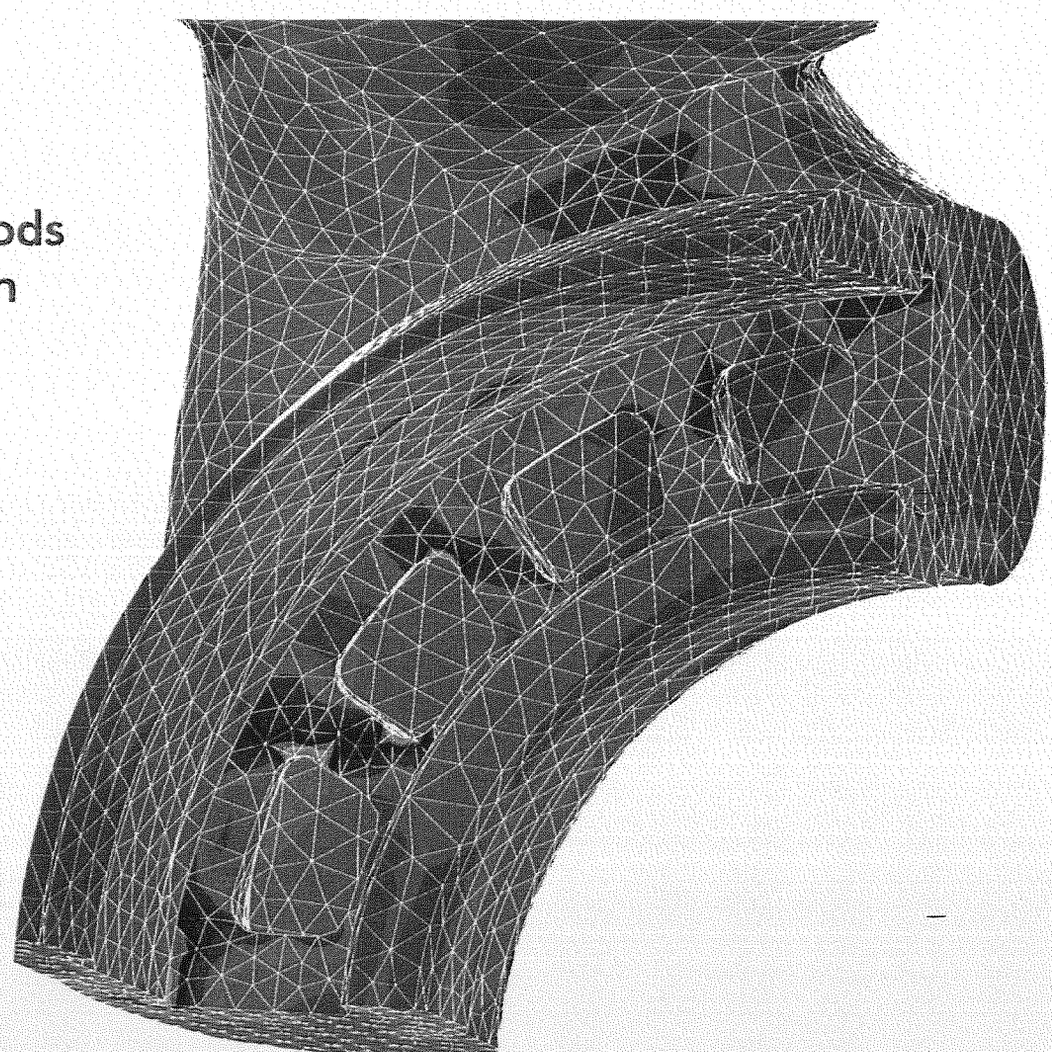
Continuous investment in state of the art design tools

Development of advanced methods for routine application in design

Engineering aspects of materials
- fracture, creep, stress corrosion
- high & low-cycle fatigue

3D finite-element analysis
- linear and non-linear
- thermal, stress & dynamics

Shaftline dynamic analysis
- Bearing characteristics
- Shaftline stability



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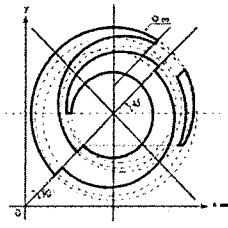


Key Factors for Success

ALSTOM

- World Beating Blading Technology
- Advanced Design Tools
- Attention to detail
- Interfaces
- Good Customer relations - internal and external
- Design Project Management
- Compatibility with OEM design
- Contingency design - the "What ifs...?"

RELIABILITY IS CRUCIAL FOR CUSTOMER SATISFACTION

ALSTOM

www.alstom.com

Cylinder

design

notes

from

Richard Plant

Intermountain HP Replant
Customer Design Review
Thursday 17th May 2001

Scope of Supply

New HP Inner Cylinder Module with Full Arc Admission

- HP inner casing shell with integral HP exhaust diffuser
- 4 welded inlet pipe connections with piston ring seals and stellited liners (fitted into existing outer casing inlet penetrations at site)
- Fully bladed HP rotor with 8 stages of advanced rotating blading with forked-pinned root fastenings and integral tip shrouds
- 8 HP fixed blade diaphragms incorporating advanced 3-D fixed blade profiles with retractable packing seals at the hubs on Stages 2-8 and extension rings supporting conventional stationary rotating blade tip seals
- Inlet (balance) gland casing with spring-backed sealing rings and incorporating inlet flow guide
- 1 locating ring with packers for locating anti-rotation keys in outer casing
- Interspace baffle ring with axial adjustment
- ~~1 set of replacement sleeves , including two spares, for the existing Ovako hydraulically expanded coupling bolts. on the HP to IP rotor coupling~~
  (To be supplied by Intermountain)
- New end piece for extraction pipe
- Miscellaneous shims and packers
- Special tooling required for new equipment (e.g. lifting equipment for fully assembled module, inner cylinder guide pillars, bolt extension measurement equipment)
- Transportation cradle and dockyard slings for the assembled inner cylinder module
- Operation and maintenance manuals for equipment supplied
- Assembly drawings, interface drawings and thermal kit revisions linked to specific equipment supplied.

HP Inner Cylinder

- Cylinder 1¼CrMoV with welded on 9CrMo stub
- Bolting 11CrMoVNbN

FEA analysis – example plots, divide up bolt loads, elastic & creep (100,000hrs)
For all components

M125 – high temperature special tapered threads / tooling hence metric size
Bolt heater holes, original 1¼" 31.75mm Alstom standard 7/8" same as GE 7/8"

Keys as original arrangement

Penetration Stress, re-inforcement around inlets

Inlet Connections
Old arrangement – seizure, leakage ? example

Materials
9CrMo inlet pipe
Haynes 25 ('flexible' stellite) outspringing rings
Stellite faced low alloy liner
Low alloy split ring and retaining ring

Rotor Cooling Connection
2 pairs of in-springing rings (high pressure drop)
Re-use existing flange, new pipe welded to suit

Steam Extraction Connection
1 pair In-springing rings with threaded retaining ring
New end welded to existing piece (original proposal)
Low alloy stellite faced
Existing stellite to be inspected after welding
Sizes to be recorded to allow option of providing complete piece for 2nd unit (unit 1)

HP Inlet Gland
Kinematic Support

- Cylinder 1¼CrMoV
- Bolting 11CrMoVNbN

2 1/4" bolts
Thermal Shield with integral splitter plate
Secondary seal for distortion

Exhaust Gland modifications
New piece bolted on
Machining new profile, original bolts retained

Rotors
Material 1%CrMoV
Shaft Line Dynamics *B Mitchell-King*
Alignment

Axial Clearances
Consider existing clearances and calculated requirement
Philosophy of not changing limits

Recommend alarm limits (can be done with existing dcs equipment)

	Expanding	Contracting
Alarm	400	150
Trip	430	170

Chart required

Radial Clearances
Standard calculation method, consideration of existing clearances
Diaphragm glands – copy of sheet

Steampath *P. Peel*
Moving Blades
Diaphragms

Solid Particle Errosion and Surface treatment *A. Holmes, B. Roberts*

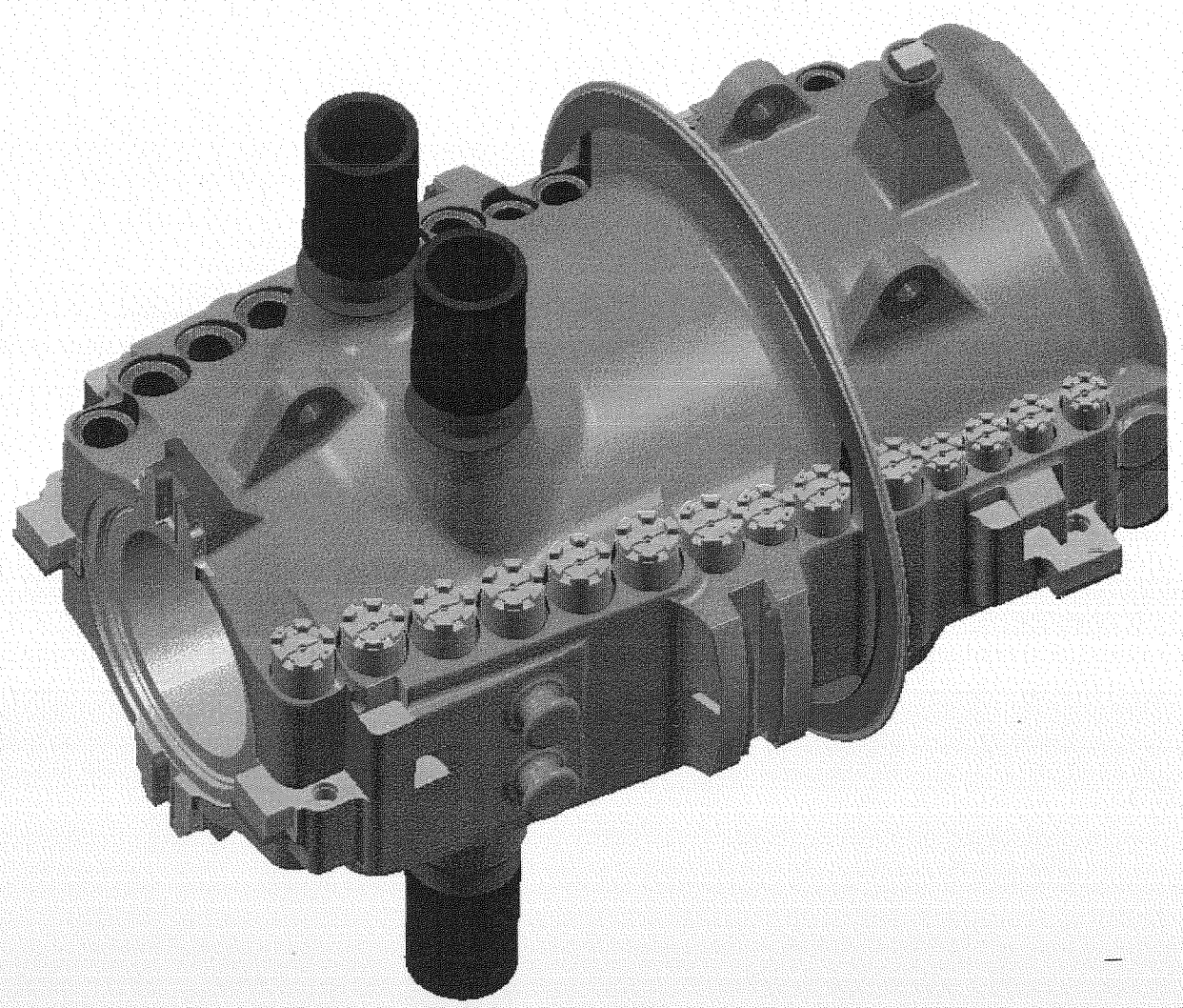
Solid

model

views

INTERMOUNTAIN HP INNER CASING MODULE

Inner casing module with casing guides and supports



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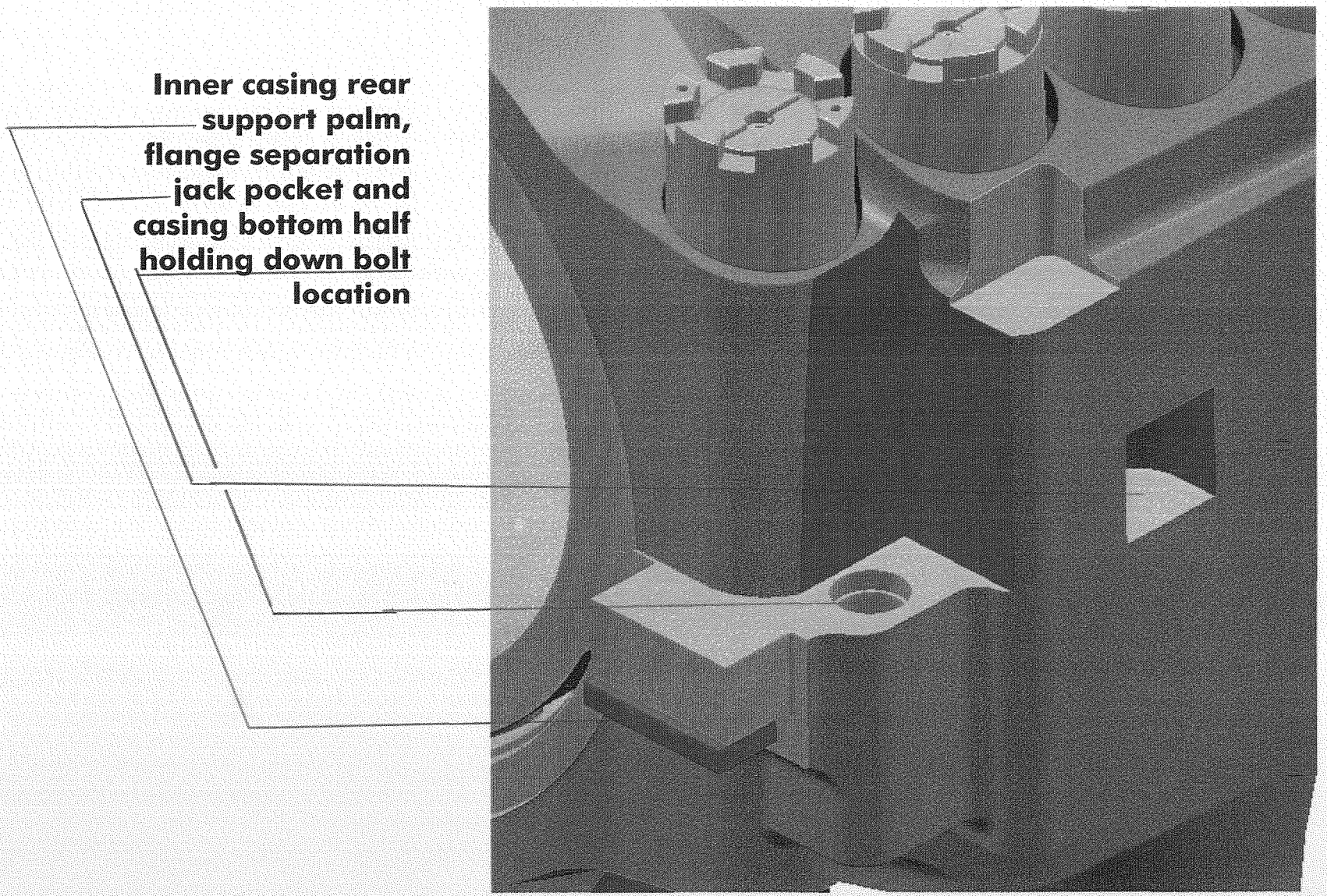
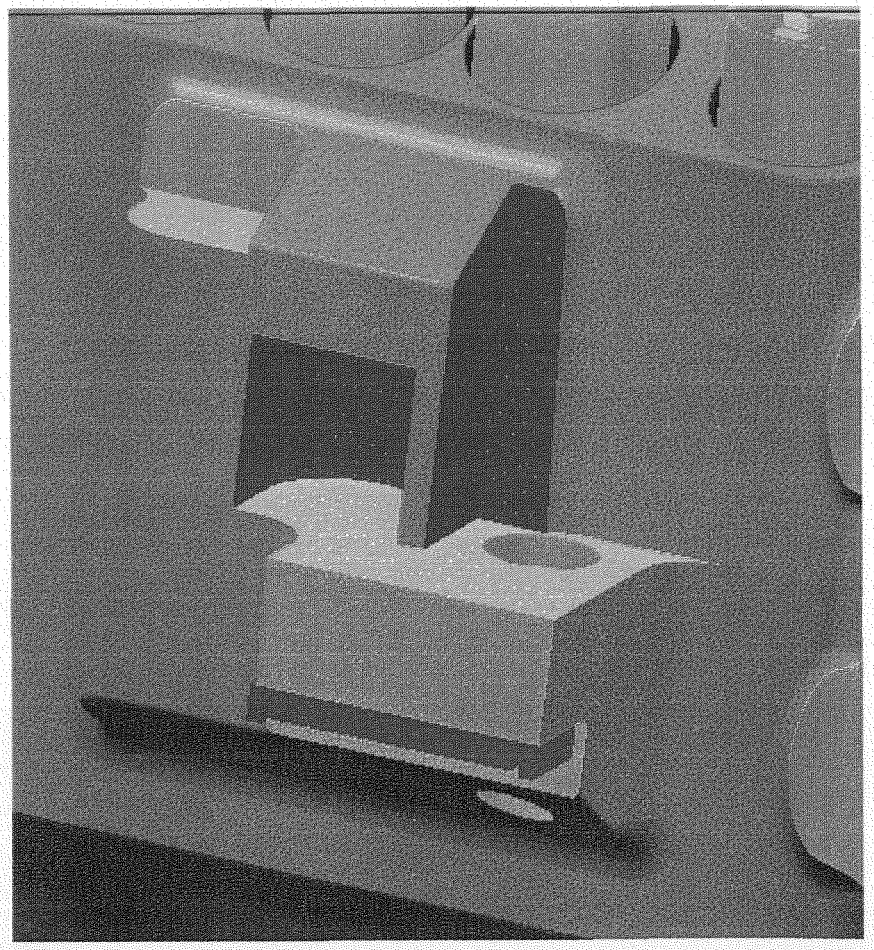
INTERMOUNTAIN HP INNER CASING MODULE



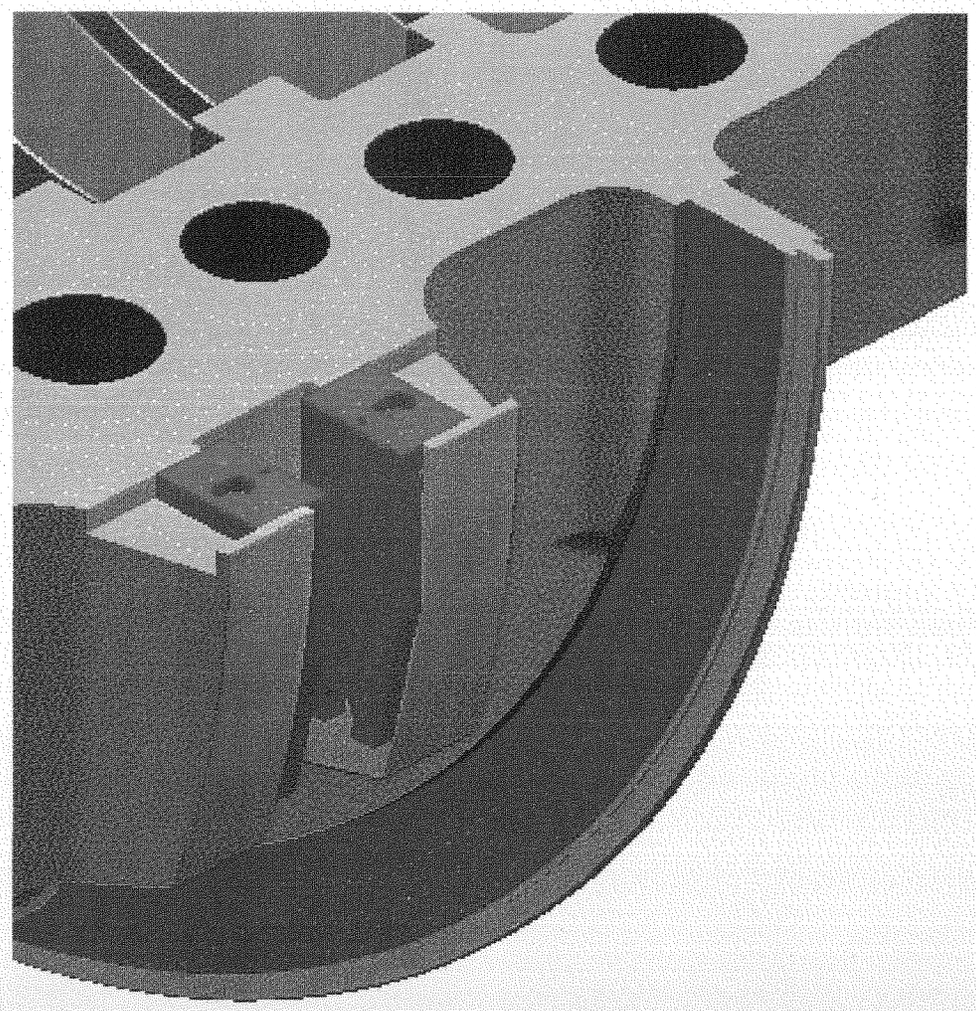
INTERMOUNTAIN HP INNER CASING MODULE

Inner casing front support palm, flange separation jack pocket and casing bottom half holding down bolt location



INTERMOUNTAIN HP INNER CASING MODULE

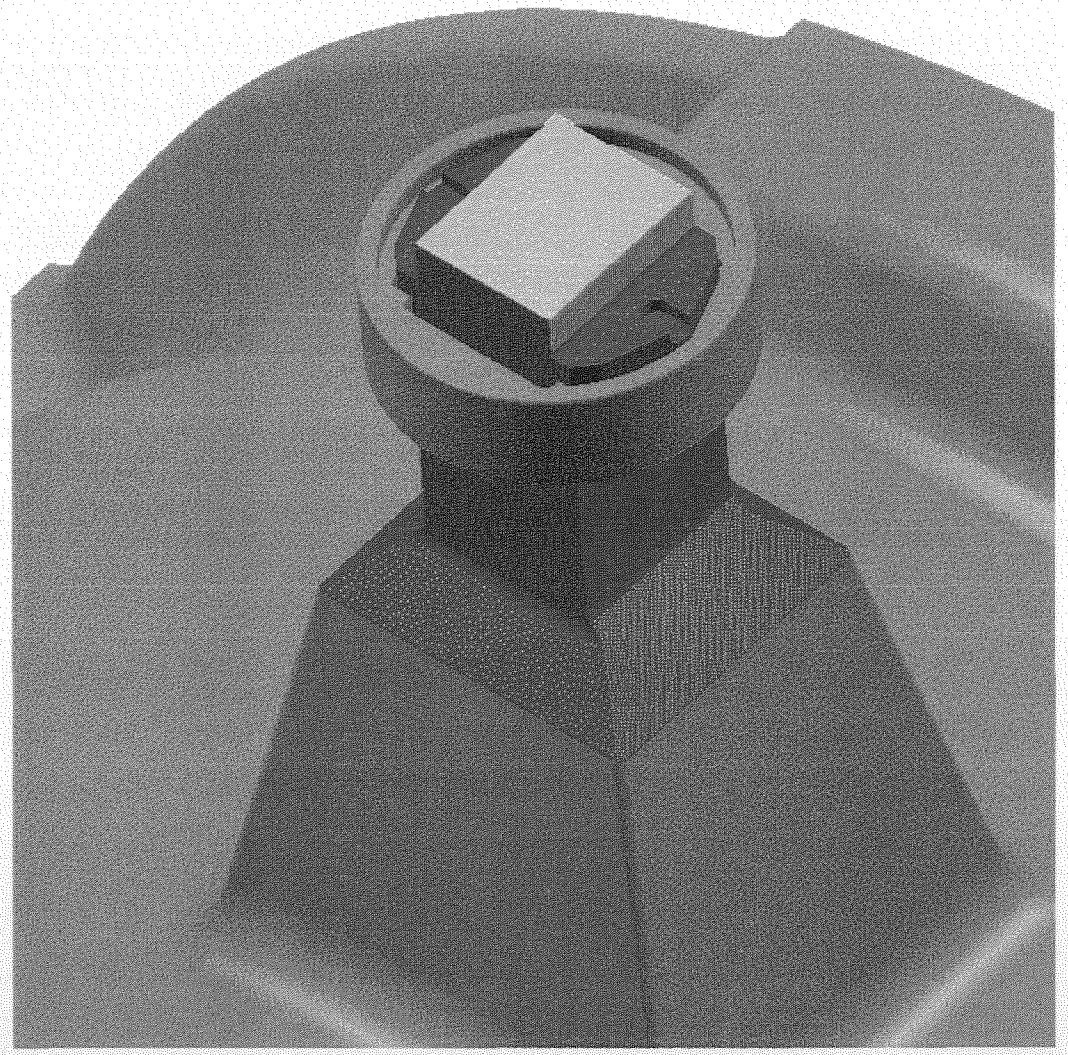
Inner casing axial packers (8 off, 4 top half and 4 bottom) and integral machined baffle



IP7_006159

INTERMOUNTAIN HP INNER CASING MODULE

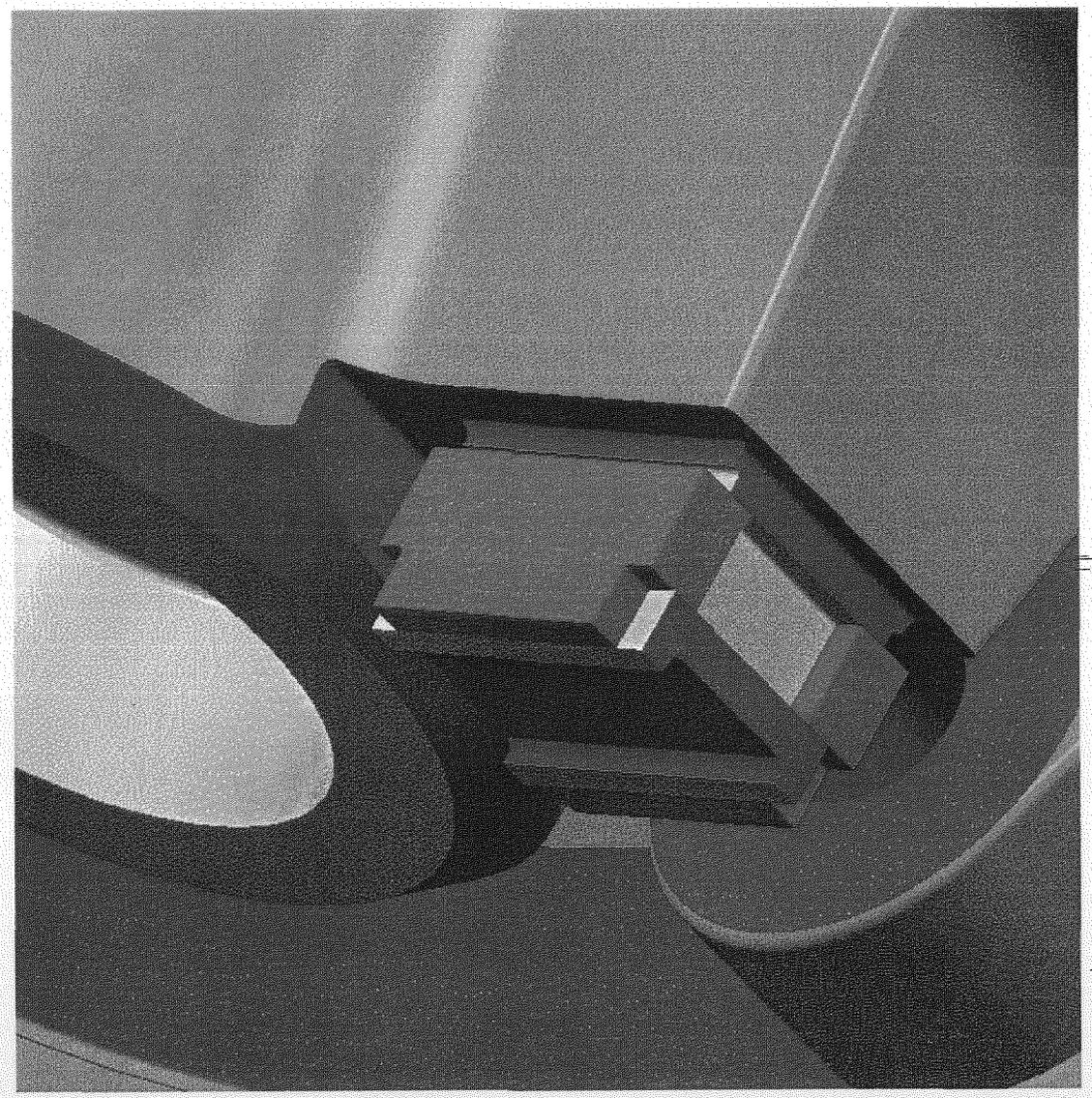
Inner casing top front transverse packers and outer casing insert



IP7_006160

INTERMOUNTAIN HP INNER CASING MODULE

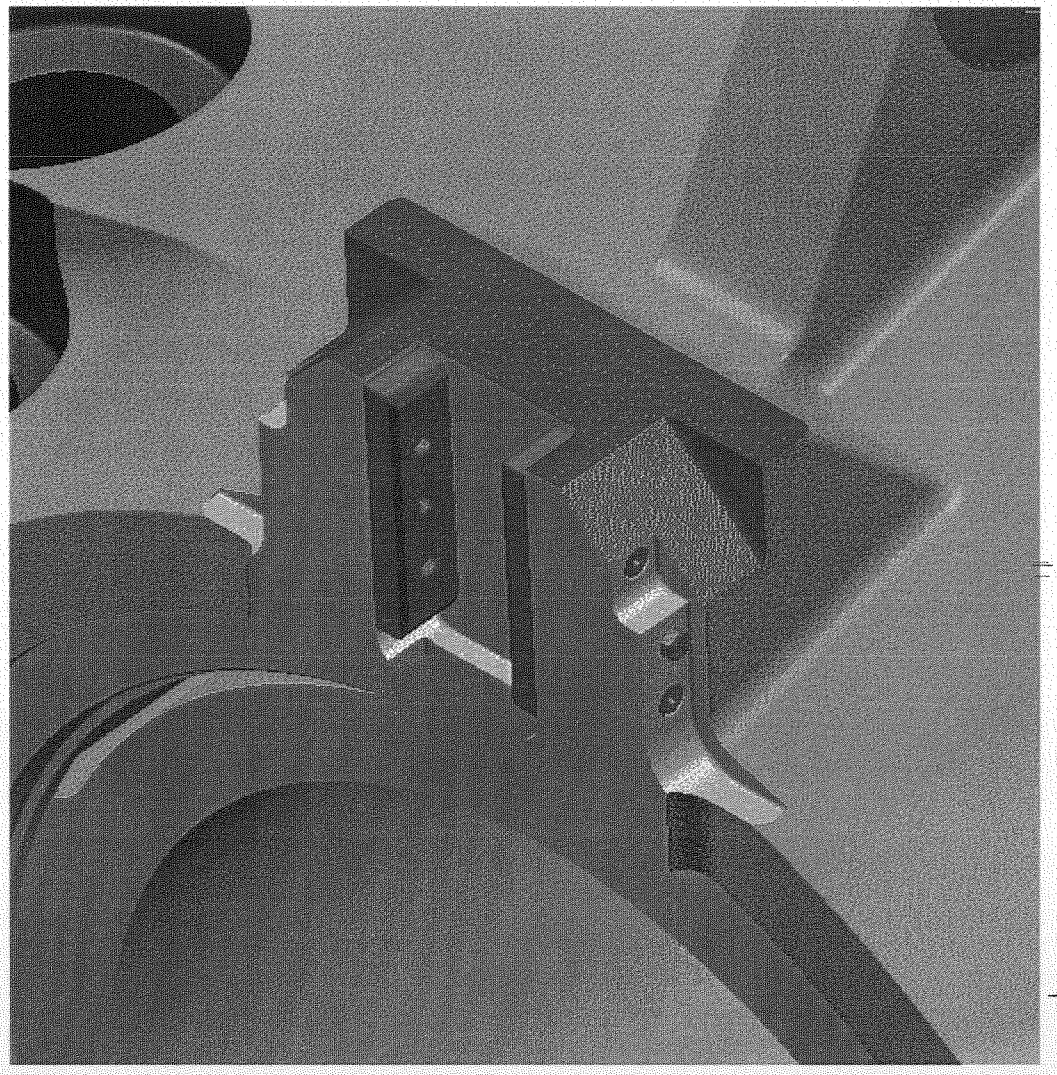
Inner casing bottom front transverse packers and heater connection



IP7_006161

INTERMOUNTAIN HP INNER CASING MODULE

Inner casing top and bottom rear transverse packers



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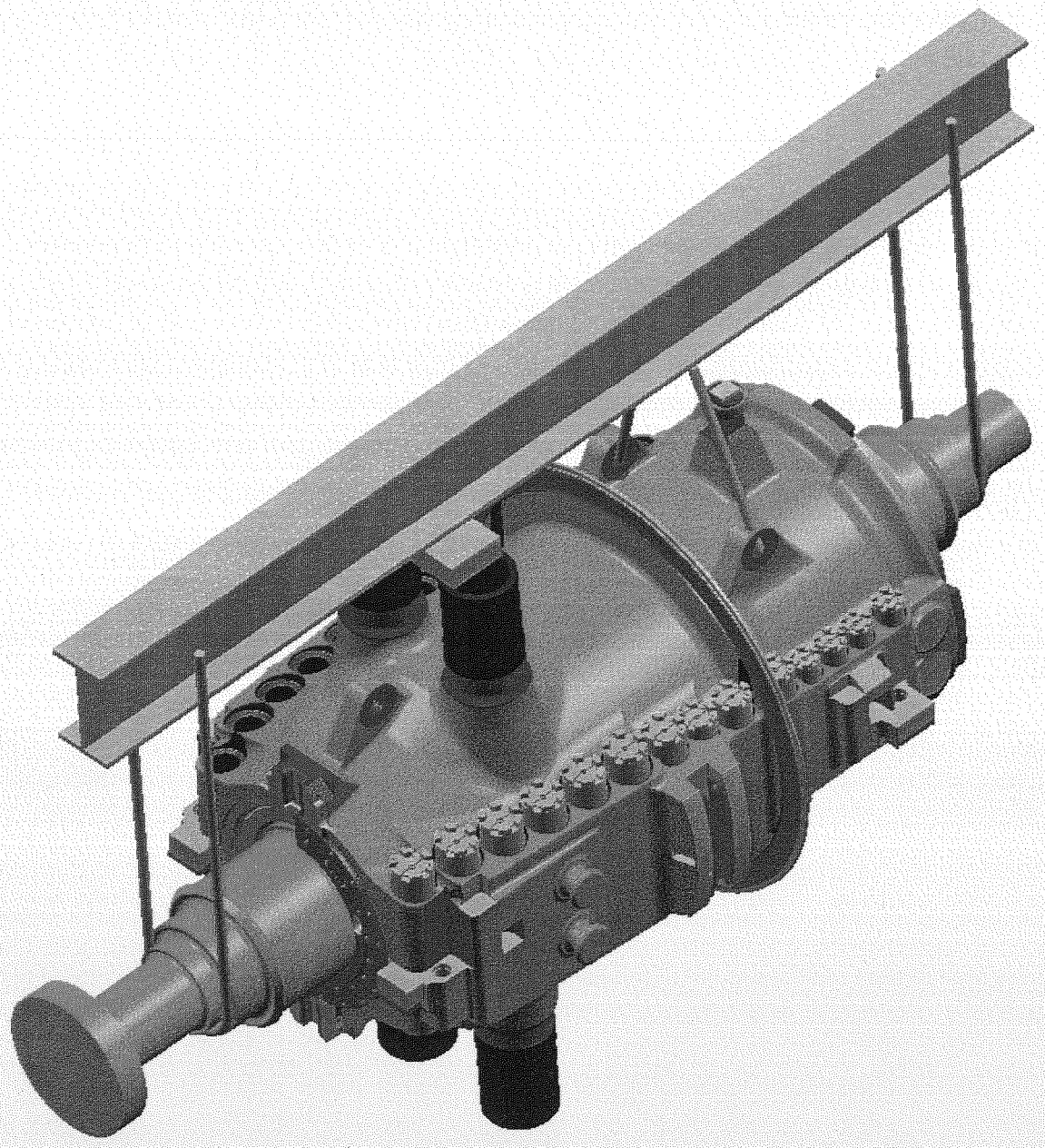
INTERMOUNTAIN HP INNER CASING MODULE

Lifting beam carrying rotor and inner casing module



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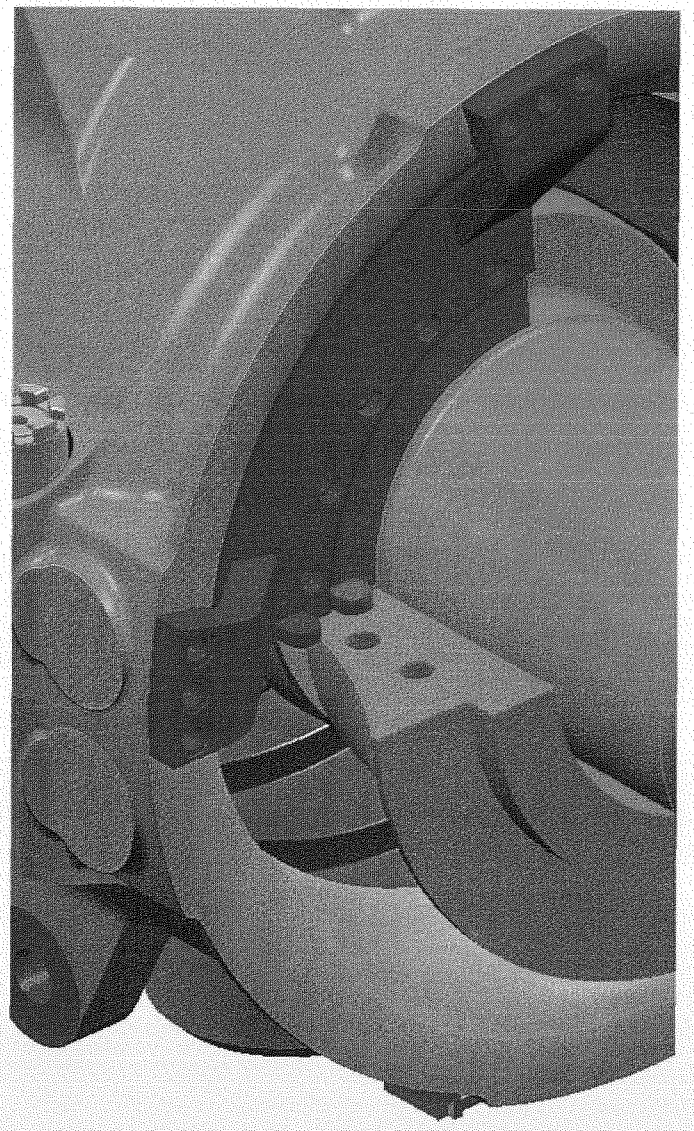
INTERMOUNTAIN HP INNER CASING MODULE

Lower casing module for final assembly with bottom half exhaust gland attached to beam.

Bottom half transportation bracket removed.



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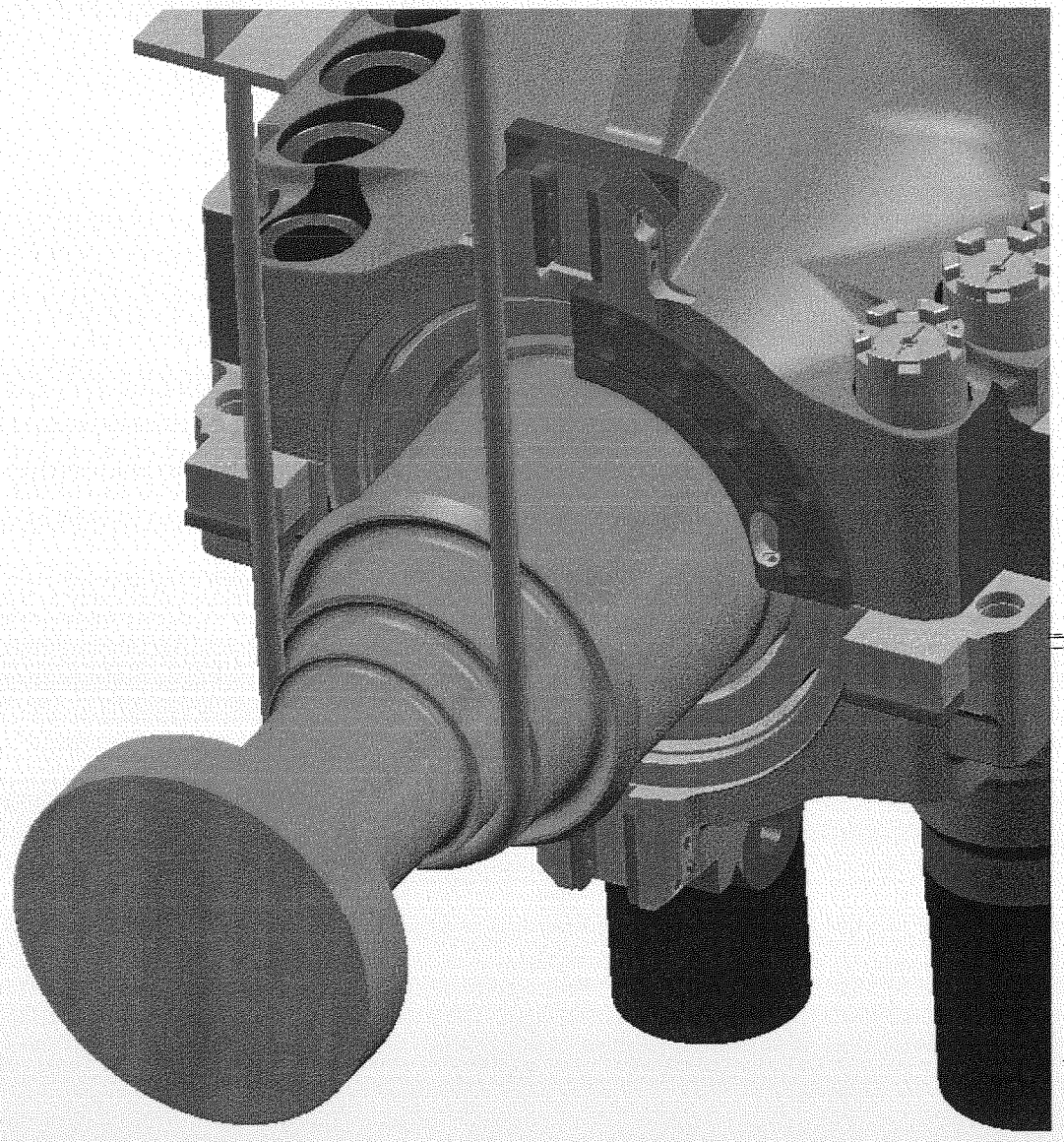
INTERMOUNTAIN HP INNER CASING MODULE

Lower casing module for final assembly with bottom half transportation bracket removed.



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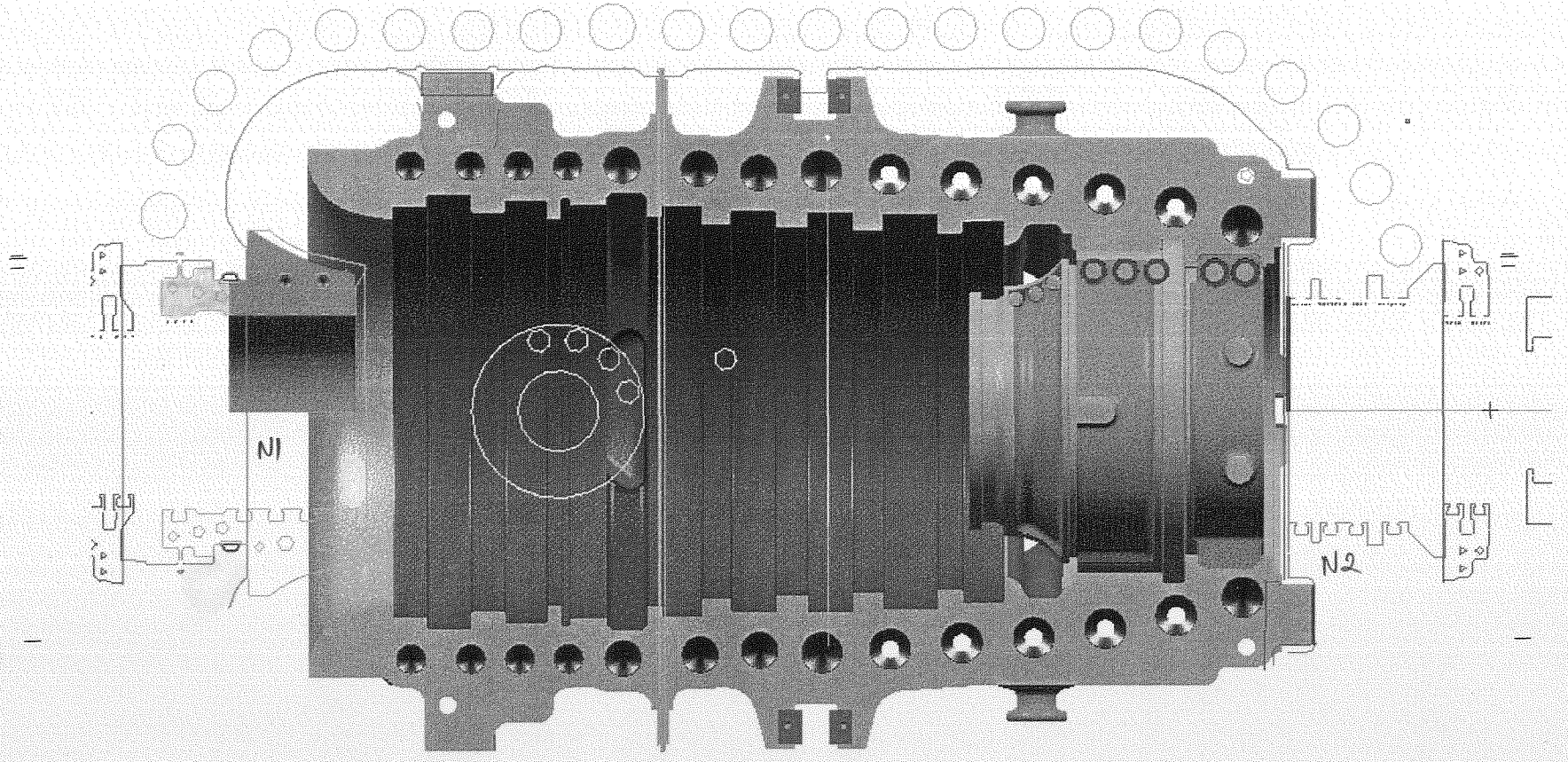
INTERMOUNTAIN HP INNER CASING MODULE

Inner casing, inlet gland and exhaust gland with Intermountain Farodata



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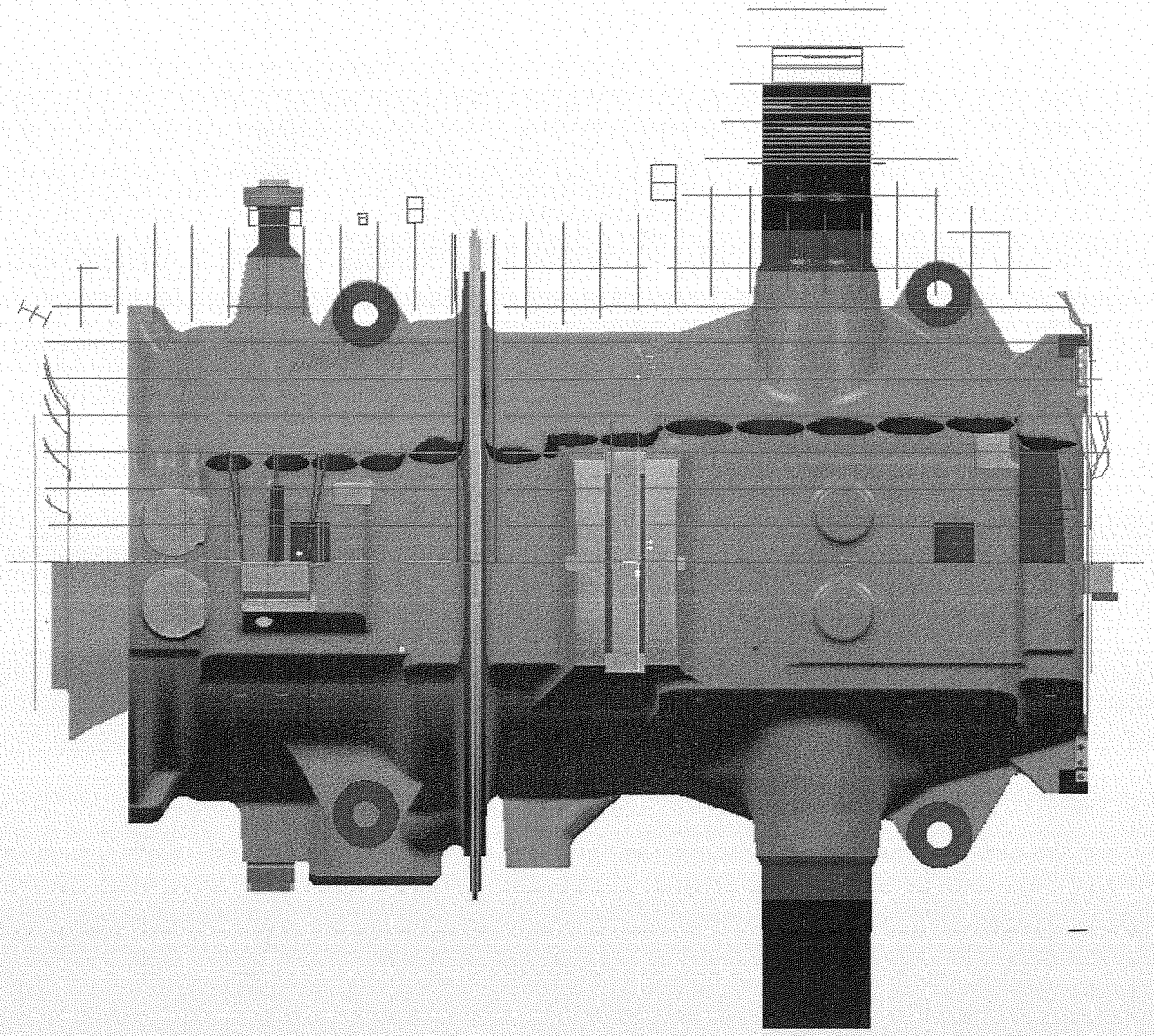
INTERMOUNTAIN HP INNER CASING MODULE

Inner casing and packers with Intermountain top half outer casing Farodata



IP7_006167

HP

Inner

Casing

Interface

List

INTERMOUNTAIN HP INNER CASING INTERFACE LIST

Ref	Descriptions	Comments	Drawing No
1	HP Inlet Connections	Outer casing pipe 12.0" bore Outer casing low ring16.0" bore Oversized stellited liners, shear rings and guide rings to be adjusted to suit at site. *Guide rings held in position by 3 dowels.* New outspringing piston ring OD = 360mm *New size*	Cross drawing A
2	Axial Packers	L shaped packers top and bottom with fitting allowance. *Standard Alstom practice for GE machines*	Packer - R297/1295 Fixing screws R297/1049
3	Top Front Gibb Key (3.5" wide x 4" long)	*Casing insert oversized.* Transverse packers with fitting allowance *Standard Alstom practice for GE machines*	*Casing insert* - R297/1119 Packers - R297/1118 Fixing screw – R297/1091
4	Bottom Front Key	Male on inner casing. Packer trapped in both vertical and axial direction and secured by 1 central screw.	New component. Packer – New Fixing screw – R297/
5	Rear Transverse Key (Top and Bottom)	*Straight packers with fitting allowance,* held in position by 2 dowels and a fixing screw. Outboard dowel shortened to miss outer casing. New inner casing machining to replicate machining of GE inner casing. *Standard Alstom practice for GE machines*	Packer – R297/1143 Dowel – R297/1142 + New Fixing screw – R297/1097
6	Front Support Packers and Counter Support Pins Note:- The counter support pins appear to be screwed in pins and NOT straight dowels.	*The depth of the support palm 4"* Packer is C shaped with fitting allowance. Held in position by ¾" UN screws. The counter support pins, diameter ¾". Dress top half outer casing half joint. *Standard Alstom practice for GE machines*	Packer R202/ Fixing screw – R297/ Counter support pins – R297/
7	Rear Support Packers and	*The depth of the support palm 4"*	Packer R202/ Fixing screw – R297/

	Counter Support Pins Note:- The counter support pins appear to be screwed in pins and NOT straight dowels.	Packer is striaght with fitting allowance. Held in position by ¾" UN screws. The counter support pins, diameter ¾". Dress top half outer casing half joint. *Standard Alstom practice for GE machines*	Dowel – R297/ Counter support pins – R297/
8	Casing Baffle	Incorporate an integrally cased in baffle. Profile with increased axial clearance in casing groove and additional restrictions (1 either side) located on outer casing machined bore.	
9	Exhaust Gland	Diffuser cone make up piece to be fitted. Cone fixed with 6 x 1" UN axial screws per half. Need to move lifting eyebolts (on half joint and on profile of exhaust gland) Dowel position and half joint bolting, no modification required.	
10	Stage 5 Extraction Spool Piece	Piston rings carried in floating C shaped carrier, held axial by ring nut. Component assembled as part of inner casing module. Provide new spool end with stellite OD, cut existing spool piece and weld on new end. Spool length cut to suit at site. Inspringing piston rings ID = 10.625".	
11	Stage 2 Leakoff (IP Rotor cooling steam)	Piston rings carried in floating C shaped carriers, held axial by ring nut. Component assembled as part of inner casing module. Provide new spool piece, to be machined at site to suit existing outer casing flange. Inspringing piston ring ID = 94mm	
12	Outer casing push pull keys	The IP rotor front coupling face provides the axial datum for the new module. Push pull keys may need adjusting to move casing casing to best position	
13	HP Inner casing module build	Similar to Genesee HP replant. 1. On initial build, module to be lowered onto	

		dummy packers, with transportation brackets fitted top and bottom. Packers thickness to be determined. 2. With contract packers fitted, module to be lowered with bottom half transportation packers removed. Bottom half exhaust gland to be located about rotor. (see photographs). 3. Top half transportation brackets to be removed with module in position.	
14	HP/IP Coupling	New sleeves to be ordered by customer Nominal size =	
15	HP stub shaft	Locating diameter of stub shaft unknown. Fit spacer between rotor end and stub shaft, to be adjusted at site.	
16	Axial clearances	Axial clearances on existing glands:- No change at front. At rear, C to increase and E to be reduced.	

Rotor

Dynamics

ALSTOM

MEETING REPORT

Subject: Rotor dynamics for IPSC

Meeting Date: 17-05-01

Author: Bob Mitchell-King

Date: 6-7-01

Participants: IPSC, RM-K, RP, AB, RC

Circulation:

Topics discussed at the Design review :

- Basis of rotorline modelling.
- Quality of bearing information
- New rotor is more flexible than the existing one >> first natural frequency = 1770rpm relative to 1960rpm which leads to a lower stability threshhold.
- A full stability calculation is yet to be completed, but swirl brake features will be required.
- Nature of excitation and damping in tip seals.
- Vibration in service – operators normally aim for < 3 mils shaft absolute.
- Customer will supply rundown vibration data for existing machine.
- There is no bad vibration experience on the present units but there is some balance sensitivity further down the unit (away from the HP).
- In response to a question, the customer was advised that journal to journal concentricity is more important than coupling to coupling.

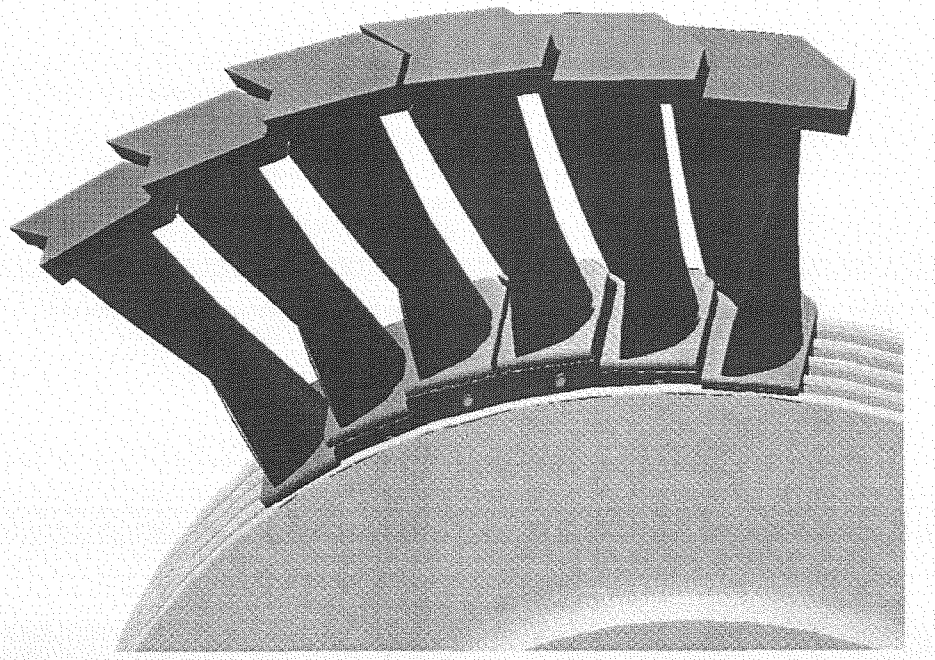
Steam

Path

ALSTOM

Intermountain HP Retrofit – Design Review – 17th May 2001
Typical pretwisted integral shroud assembly

1

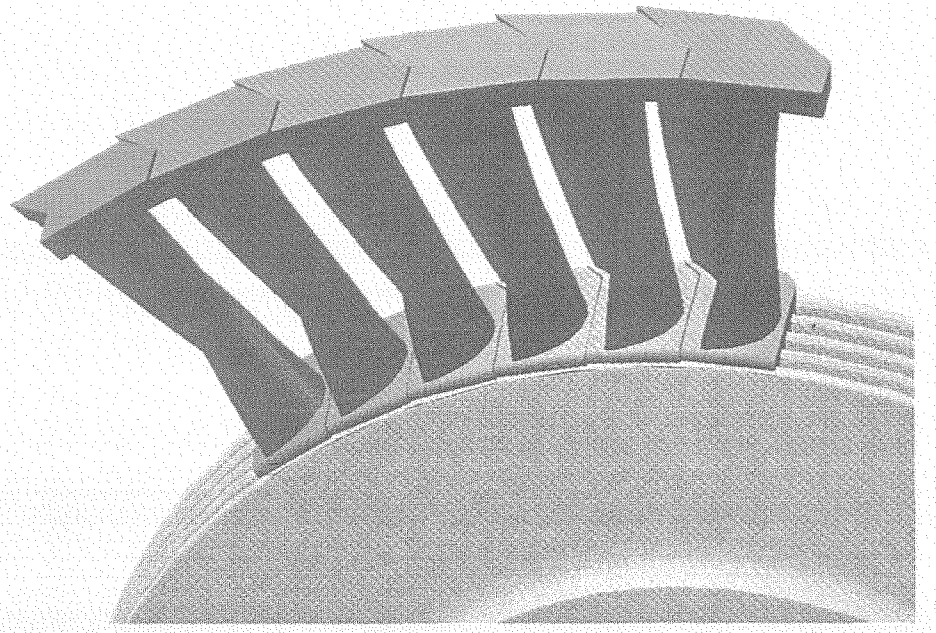


Datum Blades are pinned into the rotor using undersize pins about 40° to 50° apart.

The rest of the blades are assembled into pyramids in between the Datum Blades.

Datum Blades provide a guide for upstanding blades to ensure correct radial alignment

2



Upstanding blades lowered into the disc head.

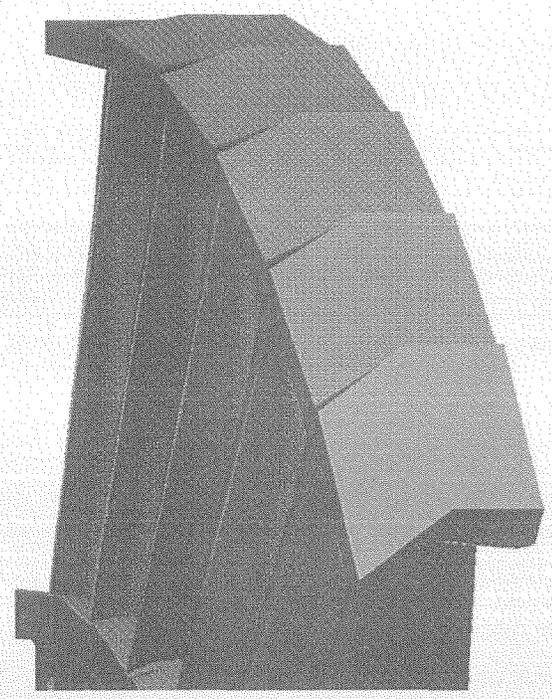
Due to a small increase of pitch on the integral shrouds the shrouds have to rotate to allow the blades to sit at the correct diameter.

This produces a twist across the aerofoil. The torque is reacted at the root fastening and produces a contact pressure between shrouds

IP7_006175

forming a rigid band around the periphery of the bladed wheel.

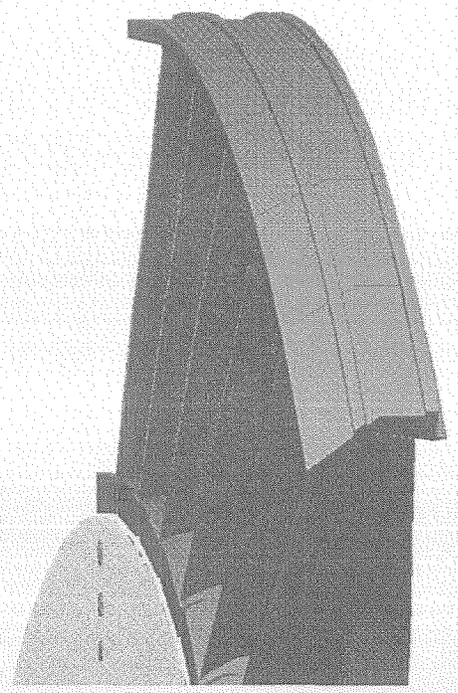
3



The rotation of the shrouds produces saw tooth effects along the leading and trailing edges of the shrouds.

The shroud and root rotations are measured to check that the correct amount of aerofoil twist has been achieved.

4

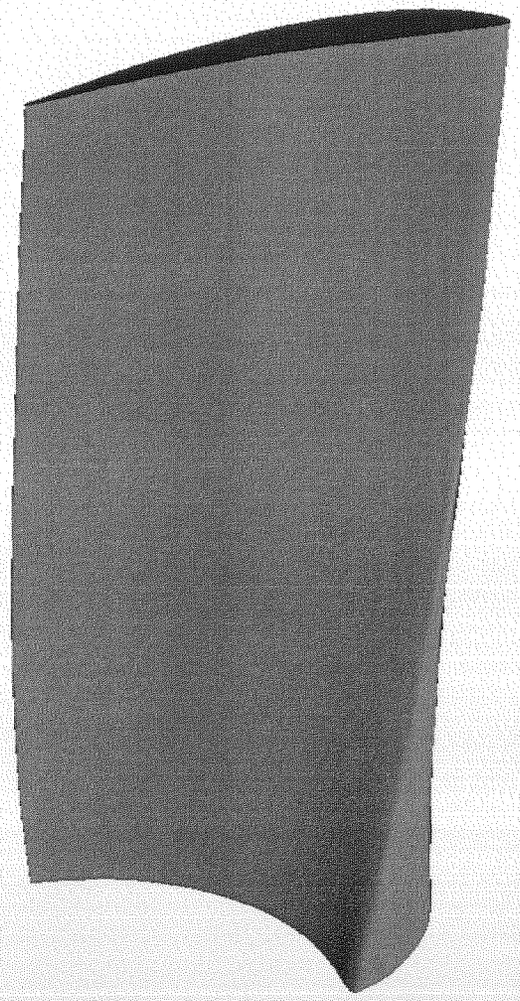


When approval of the rotation readings has been given the pin holes are final drilled and reamed, contract pins fitted and the integral shrouds machined to form the labyrinth steam seal.

ALSTOM

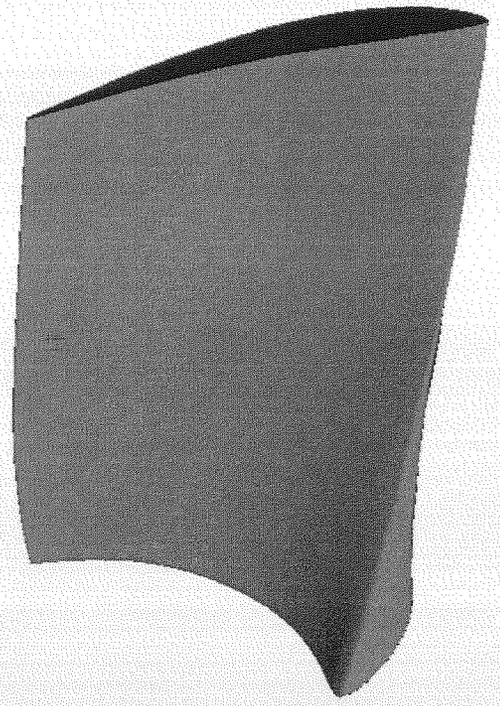
Intermountain HP Retrofit – Design Review – 17th May 2001
Moving Blades Design

1



Master aerofoil chosen from standard ALSTOM family to meet Thermodynamic and mechanical requirements.

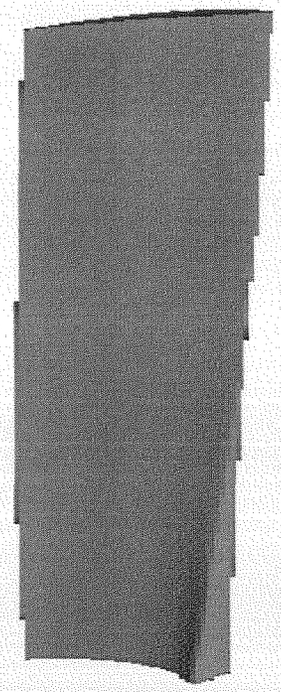
2



Aerofoil “telescoped” to give correct position of sections to match steam velocities.

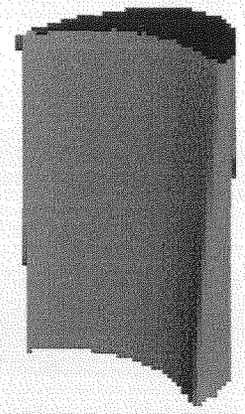
IP7_006178

3



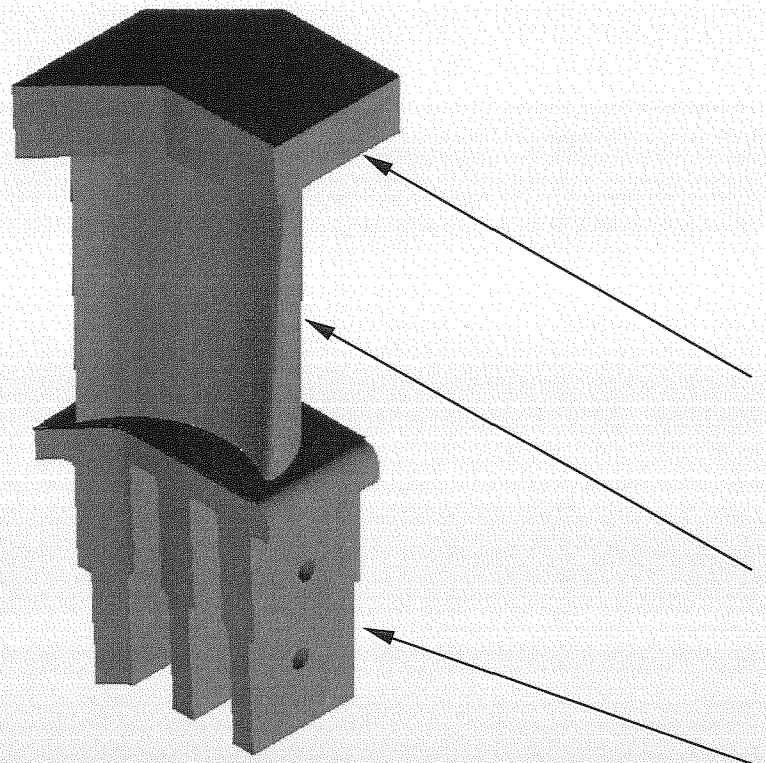
Aerofoil scaled in width to optimise design both in terms of Thermodynamic Efficiency and Mechanical Integrity.

4



Aerofoil cropped to give correct height for specific stage steam conditions.

5

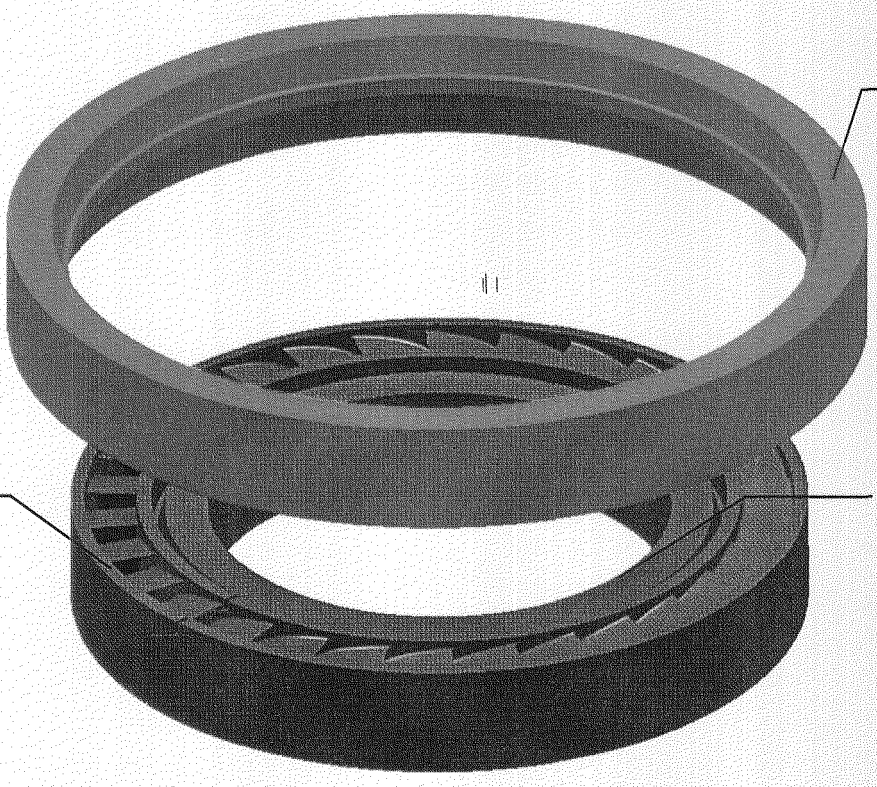


Final blade design incorporating robust integral shroud and pinned multi-prong root fastening.

Integral shroud with pretwisted assembly to provide continuous blade-to-blade connection and avoid packeted wheel vibrational response

Aerofoil generated in steps 1 to 4 incorporated into final blade

Root fastening selected from a modular range to satisfy mechanical loading requirements



Platform blades are tack welded onto inner ring.

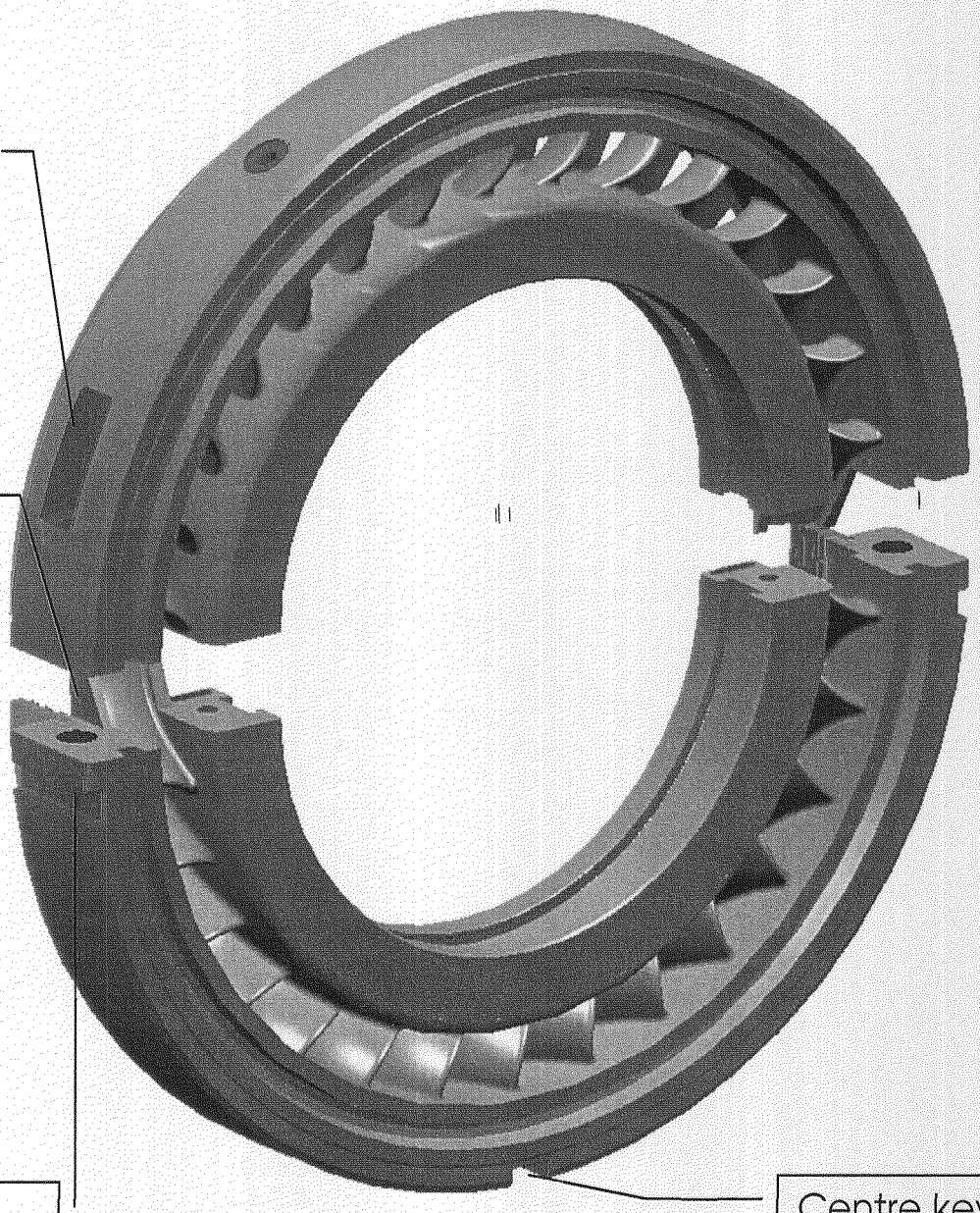
Outer periphery of blades are machined to give circular fit for outer ring.

Outer ring is heated and then fitted over inner ring-and-blade assembly.

Assembly is fully welded, stress relieved and finish machined.

ALSTOM

Intermountain HP Retrofit – Design Review – 17th May 2001
Design of Platform Diaphragms

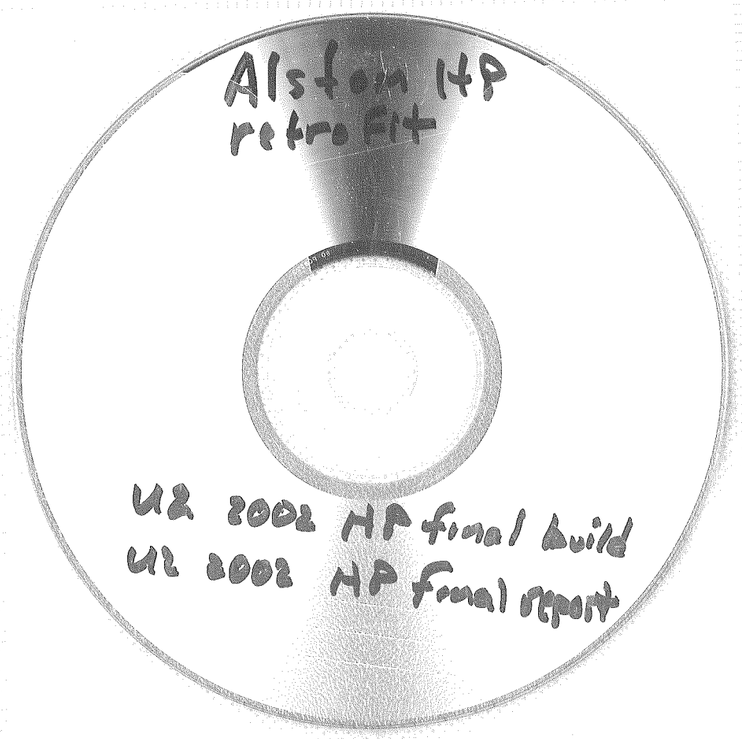


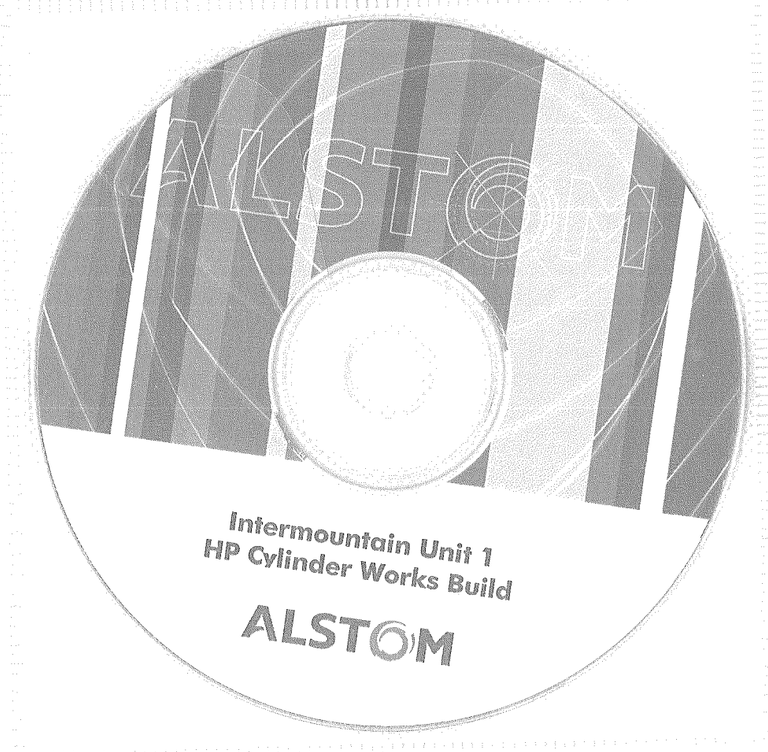
Upper Half Bolted to lower half

Scarf Joint formed from platform blade

Side Keys in lower half provide vertical alignment

Centre key in lower half provides lateral alignment


Alstom HP
retro fit
U2 2002 HP final build
U2 2002 HP final report


ALSTOM
Intermountain Unit 1
HP Cylinder Works Build
ALSTOM

IP7_006183

Intermountain 2
End of Manufacturing Report

5/02

ALSTOM

Alstom
HP Retrofit

Corporate Express

CD-Recordable
80 MIN / 700 MB
48X SPEED

INTERMOUNTAIN
DRAWINGS

COMPACT disc (Recordable)

IP7_006184

ALSTOM

Power
Customer Service, Technical Service Section

Report No: **TS 2292**
Date: 9th April 2003
Order No: 786R5600/01/006/002

Name of Station	**INTERMOUNTAIN**	Unit No: **1**	S.T. No: **T11246**
Title of Report	**HP TURBINE REPLANT**	Report By	W Falconer

Summary

The unit was taken out of service on 1st March 2003 for a planned 28 day outage.

Work included:-

- HP turbine rotor and inner shell (cylinder) replacement (upgrade)
- IP turbine inspection
- Steam admission valves inspection
- Limited generator inspection and repair
- Extensive boiler inspection and repair
- Extensive boiler inspection and modification (upgrade)
- Inspection and modification (upgrade) of various auxiliaries including boiler feed pump turbines and main CW cooling

This report describes the fitting of the new HP turbine rotor and inner shell.

The turbine generator was resynchronised on 29th March 2003, and returned to commercial operation as scheduled.

Formal performance tests were carried out during week commencing 7th April 2003. The results confirmed that the guaranteed efficiency had been exceeded.

Stripdown and rebuild record sheets are contained in Checklist No. 1175

Internal Circulation	Report Approved By:
Mr S Dugdale, Chief Turbine Engineer, LTR Dr B W Roberts, Materials Unit Mr K Spires, Project Manager, TSR	Chief Technical Service Engineer Service Engineering Contract Engineer

Output	875 MW	Inlet Press	2400 psig	Reheat Temp	1000°F
Speed	3600 rpm	Inlet Temp	1000°F	Back Press	
Commissioning Date	1986	Hours of Service of Machine		Hours since last Inspection	

Date of last Inspection	HP	IP1	IP2	GEN
	LP1	LP2	LP3	LP4
Number of Starts				
General Loading Particulars	Normally base load			

IP7_006185

CONTENTS

Page No.

1. INTRODUCTION

The Intermountain Generating Station in Utah, USA, is operated for IPA (Intermountain Power Agency) by IPSC (Intermountain Power Service Corporation). The station contains two large coal-fired units. Unit 1 is the second of two large turbine generator units, originally supplied by the General Electric Company, to be retrofitted with a new HP turbine rotor and inner shell (cylinder) designed and supplied by ALSTOM Power.

The equipment supplied was essentially a repeat of that supplied for Unit 2 but with the stage 1 diaphragm nozzle aerofoil angles modified to marginally close the exhaust ports and so reduce the steam swallowing capacity. The original GE arrangement consisted of two opposed first stage flows, followed by seven stages of impulse blading with traditionally riveted shrouds. The new rotor consists of 8 stages featuring advanced high efficiency integrally shrouded blades. The diaphragm blades are of the latest controlled flow type design. The fixed and rotating blades are protected against surface abrasion from steam-entrained solid particles by a plasma nitrided coating. The existing partial arc admission arrangement was converted to full arc admission, offering better efficiency during base load operation.

The work was planned and carried out by the power utility IPSC, and technical advice for the installation was provided by ALSTOM Power.

1.1 Outage organisation

The work was planned and conducted by IPSC using their own labour, supervision and tooling resources on a round the clock basis (nominally 12 hour shifts, seven days a week) for the duration of the outage. A number of contractors were employed to assist with the various elements of the operation.

ALSTOM Power Rugby, UK – HP turbine retrofit installation technical direction.

Edison ESI Westminster, California – Faro arm co-ordinate data for inner to outer shell interface matching (ALSTOM Power sub contract).

Laser Measurement Services Inc. (LMS) Playa del Ray, California - Laser alignment of rotor line for tops on/tops off distortion measurement (ALSTOM Power sub contract).

Continental Field Systems (CFS) Savanah, Georgia – general site machining operations including HP turbine interface features.

Mechanical Dynamics and Analysis Inc. (MD&A) Schenectady, New York – Technical direction for the IP turbine, boiler feed pump turbine and steam admission valves overhaul.

Mannings Dover, New Jersey – Bolting disassembly/assembly for the HP and IP turbine horizontal joint flanges.

Turbocare Chicopee, Massachussets – supply and fitment of HP outer shell rotor glands.

Nova Tech Inc. Fort Collins, Colorado – Supply and installation of new PCB's to suit the modified governor valve characteristic required for conversion from partial arc to full nozzle arc control (ALSTOM Power sub contract).

IPSC personnel carried out instrumentation removal, calibration, and replacement.

1.2 Schedule outline

The machine was shut down early on 1st March 2003 for a planned outage of 28 days duration. Insulation blankets were removed from the top half shell barrel and the horizontal joint flange. Forced air cooling was applied to the HP and IP turbine horizontal joint bolts to promote cooling and so accelerate bolt removal.

The outage planning arrangements allowed for one test fitting of the new inner shell and rotor for acquiring setting data, following removal of the existing rotor and inner shell components. On completion of this initial measurement exercise the new rotor was removed and followed by a 'tops on/tops off' laser alignment procedure was carried out.

The new inner shell was then removed to permit various machining and fitting operations. These included steam inlet and steam extraction location bores and components, various key and support packers, and the exhaust end packing head (glandbox) which was sent to an off site machining facility.

The replacement inner shell bottom half was finally fitted followed by the rotor, top half diaphragms, inlet and exhaust gland packing heads, and top half inner and outer shells. Activities occurred generally in line with the station programme and the machine was restarted on Saturday 31st March as planned.

2. HP TURBINE STRIPDOWN

2.1 As found inspection

Because the rotor and complete inner shell were being retrofitted, inspection was limited to that necessary to gain a knowledge of previous running conditions, and for historical analysis. Observations can be described as being generally similar to those for the Unit 2 examination in 2002. Refer to report TS 2236.

The rotor was found to be in essentially undamaged condition with abrasion and multiple impact markings present to varying degrees on all blade aerofoils as a result of SPE (solid particle erosion). The journal surfaces had suffered only very light scoring due to foreign material in the lube oil supply.

Both left hand and right hand flows of inlet nozzles were in poor condition having suffered what is assumed to be the effects of SPE. This had resulted in significant loss of blade material at the trailing edges due to wear and fracture. In the main damage was located adjacent to the horizontal joint positions in both top and bottom halves. Photographs 1 and 2

The inlet gland had suffered heavy rubbing in the bottom centre position. Photograph 3. There was little sign of rotor contact in the top. The diaphragm rotor gland seals had also been rubbed in the bottom being worst at stages 2 to 4 i.e. the mid span position of the rotor. As these packing rings are all of the retractable type it must be assumed that the rubbing took place at high loads. There was no sign of the rings being stuck in the running position, and there is no reason to suppose that they may have been temporarily lodged during a shutdown. The precise reasons for the rubbing remains speculative.

There were no deposits of note on either fixed or rotating blade surfaces.

The T1 and T2 bearings exhibited normal load markings and appeared visually in good condition. Photographs 4 & 5. Subsequent ultrasonic NDE confirmed satisfactory white metal adhesion

2.2 Stripdown measurements

Because of the need to disassemble the shell as rapidly as possible due to programme restraints, and because there were no essential radial or axial clearances required, measurement was limited to a number of datums. These included rotor radial datums at the T1 and T2 standard oil deflector positions, and at the outer shell bolt on gland packing cases (bolt on gland boxes) and shell end bores. The axial position of the control rotor with respect to the shaft driven oil pump in the front standard was also recorded, though with the machine still relatively hot this had limited value.

The vertical datums measured at the T1 and T2 standards were considered unsatisfactory due to access difficulties. To ensure valid readings were obtained the rotor height with respect to the standards was established by 'bridge gauge' using vee blocks set on the horizontal joint and a straight edge.

The outer shell height change between support on the running keys, and that on the build keys was recorded during the changeover. Also recorded were the relative heights of the four corners of the existing inner shell with respect to the outer shell to assist with trial fitting of the new inner shell. Horizontal joint step measurements were made at the N1 and N2 packing heads relative to the outer shell, though there was no intention to disturb the bottom halves.

3. TRIAL FIT OF THE NEW INNER CASING AND ROTOR

Once the old rotor and inner shell had been removed the inlet bores and HP bled steam connection bore were honed to clean the surfaces and to remove any ovality present. Various measurements were taken in the top and bottom half outer shell using a Faro arm.

3.1 HP inner casing

On completion of the Faro arm measurements the new bottom half inner shell was lowered into place on temporary support packers sized to give adequate clearance with the rotor, and aligned axially and transversely close to the expected final position. A spare packer had been supplied for the front bottom transverse location key which is inaccessible with the inner shell fitted, and this allowed an equal/equal initial sizing for the packers so that the bottom half shell could be approximately centralised. The bottom half exhaust gland packing head was also refitted.

The inner shell was checked for a 'soft foot' by carrying out a weighing exercise at the four palm positions. Adjustments were made as necessary by shimming at the palm supports to give equal loading. Additionally a precision level instrument (Cookes level) was used to measure the inner shell inclination with respect to the outer shell.

3.2 HP rotor

With the inner shell in place the new rotor was installed, and the radial position established with respect to the front and thrust standards, and to the outer shell packing head bores. The rotor was positioned axially to best advantage to suit the new outer shell shaft glands.

Having established the rotor axial and transverse radial position within the outer shell, the inner shell was manoeuvred until the correct axial and transverse radial location relative to the rotor had been achieved by comparison with the works build figures. The axial position of the rotor with respect to the inner shell is easily maintained using the brass setting gauge supplied for this purpose, during positioning operations.

The vertical position of the bottom half inner shell relative to the outer shell was determined using bridge gauge measurements at a location each end of the inner shell. Gland to rotor side clearances were measured at a number of positions. An ERAG device (otherwise known as an electronic mouse) had been made available and this also was used to establish the radial position of the rotor at each end of the inner shell. The figures obtained from all of the above were compared to the works build figures. The outer shell/rotor end bore datums and packing case bores/rotor datums were taken, together with various inner to outer shell datums.

From all of the above information correction data was established.

At this stage the rotor was removed and placed in the lathe with the IP rotor for setting of the couplings (see section 5.10).

4. HP TOPS OFF/ TOPS ON DISTORTION – LASER MEASUREMENT

With the rotors removed a laser line was set spanning not only the HP but also the IP turbine centreline, as both shells were measured in parallel.

Datum measurements were initially recorded in the open (tops off) condition. For the HP these included reference points at the T1 and T2 bearing bores and the outer casing end bores. Readings were also recorded at a number of locations in both the inner and outer shells.

The inner casing top half was then fitted to place and the horizontal joint lightly bolted only, as being a new assembly there is no distortion present. The outer shell was fitted and a survey made of the unbolted horizontal joint gap. This indicated that the expected relatively moderate levels of distortion were present. The horizontal joint bolts were then fitted and fully tightened.

At this stage a second set of laser readings were taken at the identical locations as previously taken in the tops off condition. The algebraic differences in readings between the tops on and tops off condition could then be calculated to arrive at correction values for inclusion in the final inner shell support and location key packer sizes.

Finally the outer casing support was transferred from the build keys (lower half support) to the running keys (upper half support) to establish the effect on the vertical and horizontal position of the complete inner/outer shell assembly, as measured at the outer shell end bores, relative to the T1 and T2 bearing bores. The movements seen were much as expected and broadly similar to those seen for the Unit 2 HP replant in 2002.

Refer to Appendix 1 for spreadsheets recording the measured values and calculated movements.

5. INTERFACE LOCATIONS BETWEEN NEW AND EXISTING COMPONENTS, AND ASSOCIATED MACHINING ACTIVITIES

Details of changes associated with the interface features between the old and the new equipment are shown on Interface drawing R202/A0/5396. The HP module general arrangement R277/A0/1341 should also be referred to.

5.1 Inlet connections

Reference drawing R202/A0/5387

The bores in the outer shell were honed to clean up and to remove any ovality which might be present. The hole centres were measured with respect to an outer shell datum position in both axial and transverse planes. This was compared with similar measurements recorded during manufacture of the inner shell. Once the new inner shell position had been fixed in the outer shell it was found that radial clearances for all four inlets were within tolerance thus eliminating the need for eccentric machining of the liner and guide ring. Circumferential locating pegs and slots are required where eccentric machining is necessary so these also were not needed.

The new hard-faced bore liners, retaining rings and guide rings were machined to give the required fits with each other and with the outer shell bores. The retaining rings were finally segmented and the assemblies completed.

5.2 HP heater bled steam connection

Reference drawing R202/A1/5380

The pipe was cut close to the flange on the outside of the outer shell, and the flange removed for modification. This consisted of honing the bore and fitting a liner, segmental ring and retaining ring. A new spool piece with a stellited section at the upper end was machined to give a shrink fit with the liner, and to give acceptable end clearance when in situ.

Whilst the lower end is fixed, the upper end is arranged to locate with a free floating seal arrangement. Faro arm checks confirmed that the axial and radial clearance margins were more than adequate to meet drawing requirements in the assembled condition.

5.3 HP leak off steam to IP rotor cooling

Reference drawing R202/A0/5397

A new pipe insert with integral flange and stellited top end was supplied. This was machined to suit the existing flange arrangement on the outside of the outer shell. Faro arm measurements confirmed that the generous axial and radial clearances designed in by virtue of the floating seal arrangement were present. The length was adjusted to give the drawing end clearance with the inner shell. Once assembled to position the new pipe insert was welded to the existing pipe.

5.4 Inner shell supports

The original inner palm support packers were removed and used for jig drilling the new packers. The old packers were used for initial setting of the new inner shell. A number of the existing packer retaining screws were broken and required drilling out. The size of the holding down fasteners has, by design, been increased from original.

5.5 Inner to outer shell axial and transverse location keys

All axial and transverse location keys/keyways were modified to take adjustable packers which allow fine setting of the inner shell with respect to the outer shell. The packers are attached to the key, or keyway, on the inner shell to eliminate the need for modification to the outer shell.

The top front transverse location key is located in a circular insert fitted into the outer shell. A new insert was provided with adjustable packers which were later sized to suit the required inner shell position.

5.6 Inner to outer shell steam baffle

The inner to outer casing interspace baffle on this inner casing is an integral part of the inner casing. The axial and radial clearances between the baffle and the outer casing were all within design tolerances.

5.7 Inner shell holding down bolts

The bottom half inner shell is fitted with holding down bolts for securing to the outer shell. The rear bolts were located in the same position as the original, but those at the front required repositioning to suit the new casing. The centres for these bolts were marked out during the trial fit of the new shell, and drilled and tapped prior to the final build. The new upper half casing does not overlap the bolts so L-shaped blocks are fitted to the upper casing to prevent the bolts unscrewing in service.

5.8 N1 exhaust gland packing head

The exhaust gland packing head was fitted with a ring extension to increase its axial length. After welding of the now redundant lifting eyebolt holes, the steam swept outer surface profile was modified by machining to match the stage 8 blade passage exhaust floor. This work was carried out at an off site machining facility in Salt Lake City, and supervised by Continental Field Systems.

5.9 N1 packing case, and N2 packing case and packing bore

New gland rings were supplied by IPSC, which were of Turbocare, and Steam Specialities manufacture. Turbocare technicians final-machined the seal fin bores to achieve the new design radial clearances with the new rotor incorporating allowances for the existing T slot bores ovality as measured.

5.10 HP/IP rotor coupling

The HP and IP rotors were placed in a portable lathe supplied by Continental Field Services, set up on the turbine deck. Truth checks were conducted on the IP rotor after 5 hours of continuous rotation to eliminate any bow due to lying stationary, as the rotor was suspected of having a slight permanent bend. The runout at the worst position was 0.0045" TIR at midlength. Runouts of 0.003" TIR were recorded at front and rear coupling peripheries, both at similar circumferential locations, and at 180 degrees to the peak of the rotor centrespan runout. No significant face error was recorded at the IP rear coupling (<0.0005"). There is no record of the runout for the IP rotor front coupling face. It had been judged safer not to machine the IP coupling faces unless absolutely necessary as this could have a detrimental effect on the overall balance condition. The problem with balance was further complicated as this rotor was considered to be thermally unstable.

The new HP rotor was orientated circumferentially with the IP rotor so that the phase marker matched the exact same position as the original rotor.

Alignment of the two rotors was achieved, followed by setting of the coupling concentricity (journal/journal) using slave bolts. Once satisfactory concentricity had been attained the coupling holes were line bored and finish honed. The original bolts were reused and new bolt sleeves fitted, machined to suit the new hole sizes. Photograph 7.

The rear coupling on the new HP rotor does not have a spigot (rabbit) as with the old arrangement. This eliminates the need to jack the HP rotor and outer casing axially towards the front to part the coupling for alignment checks, or for removal/installation of either HP or IP rotors.

5.11 Control rotor

The existing control rotor was refitted after confirming that the spigot (rabbit) had the correct fit with the HP rotor. This was confirmed to be within the design tolerance of 0.0005" clearance to 0.0015" interference. No machining or corrective work was necessary.

5.12 Ist stage pressure and temperature measurements

The original inner shell had three thermocouples located after stage 1 which, in conjunction with the pressure monitor, were used for stress controlled turbine run-up and loading. Experience shows that thermocouples are prone to failure when fitted in inner casings. New thermocouples were, therefore, fitted in the top right side inlet pipe which is integral with the outer shell. The response of the thermocouples at this location will be the same as if fitted at the stage 1 position.

On the original inner casing there was a tapping for measuring 1st stage pressure. This is not required with full arc admission and has been deleted on the new assembly, the hole having been blanked by IPSC at the outer shell external facing. The pressure sensing pipe is now connected, externally, to one of the steam inlet pipes, at a location after the control valves.

5.13 Balance plane access holes

The access hole plugs in the bolt-on gland boxes (packing casings) were removed on Unit 2 following the replant and the balance plane holes in the rotor found to be out of line with the access holes. This was checked on Unit 1 and the holes found to line up perfectly.

It was reported by station staff that trim balancing had not been carried out at any time since original commissioning on the HP turbines so this problem had not been identified with the original GE rotors in place. As the two new HP rotors are identical it is certain that the mismatch on Unit 2 is a result of a problem with the gland boxes, and not with the new rotors.

6. FINAL ASSEMBLY

The inlet liners, retaining rings and guide rings were fitted into the outer casing and guide ring retaining dowels peened to lock (staked).

The heater connection flange, complete with new interconnecting spool pipe, was fitted and bolted to the outer casing with a new gasket supplied by IPSC. This activity occurred after the bottom half inner shell was finally in place.

The inner casing support packers were sized taking into account the tops on/tops off correction factor so that the vertical clearances would meet the design criteria in the fully boxed condition i.e. as works build. They were secured to the ledges in the outer shell with the new larger screws supplied by ALSTOM Power.

The inner to outer casing transverse location, and axial location key packers, once machined to size, were bolted, doweled and locked according to drawing instructions.

A television inspection of the bottom half inlet pipes and cold reheat pipes was carried out by IPSC.

The inner casing lower half was fitted to place followed by the N1 exhaust gland packing head bottom half. Photograph 8. Half joint steps confirmed the correct relative positions of these components were as intended.

The rotor was fitted (photograph 9) and the vertical position relative to the bottom half inner casing confirmed by bridge datum and by ERAG measurement. With the rotor centralised in the bearings side radial clearances and axial clearances were confirmed to be satisfactory. An unboxed bump check verified the total axial float and touch points in the expanding and contracting directions was as expected. Spot checks were made to confirm the expanding (rotor long) and contracting (rotor short) clearances were to design requirements in both inner and outer shells, with the rotor in cold set position. A 'weight on' HP/IP rotor alignment check was carried out and T2 bearing adjustments made as necessary. The changes in rotor height were subsequently accounted for in the final running key adjustments.

The top half N1 exhaust gland packing head was fitted with a top lead in place to confirm that vertical clearances were acceptable – a height adjustment had been made earlier on the side support keys. Once this gland box had been finally fitted, the top half inner casing was fitted (photograph 10) and a further bump check made to confirm the expected axial clearances were still present. The shell half joint bolts were fitted and stretched using electric resistance pokers, and the bolt extensions subsequently checked to be within design tolerance. The inner shell holding down bolts were fitted together with the bolt retaining brackets. The anti rotation crushing pegs were fitted and clearances checked. The top half outer casing was lowered into place, and a further bump check made confirming expected axial clearances were present.

The transfer from build keys to running keys indicated an outer casing height change with respect to the rotor, as measured at the casing end bores, of down 0.005" at the front and down 0.010" at the rear. New running packers were machined and fitted, to recover this change.

Finally the complete HP rotor and outer shell assembly were moved towards the rear to meet the IP rotor, and the coupling bolted. Concentricity checks confirmed that the required values had been repeated from the earlier lathe build. The rotor train was set on the front thrust pads. The rear push/pull key packers were adjusted to

suit this new position for the outer shell (clearance set on the front packer of the rear push/pull key assembly). In this condition a rotor to main oil pump axial datum was recorded in the front standard (refer to the build checklist No. 1175).

Thermocouples were fitted by IPSC to the outer casing to measure top to bottom temperature differential. These were attached to the outer skin at approximately mid length, and at an angle of approximately 10° to the vertical plane to avoid steam leak off connections. Photographs 11 and 12

With the machine finally on turning gear and start-up preparations well advanced it was found that the instrument for the HP (and indeed IP) differential expansion had not been calibrated despite earlier prompting. It is understood that this was due to a reluctance to re-dowel the coil head assembly to the standard in the mistaken belief that there had been no change due to fitting of the new rotor. In practice, of course, there is a change possible as a) the rotor lengths could be marginally different old to new, and b) an optimum axial position for the new rotor was selected relative to the outer casing glands during assembly operations.

It was reported by the MD & A engineer that data retrieved from the logging system showed that, with the rotor stationary and located axially on the front (datum) pads (26 March 2003), the instrument was reading 0.624". The GE cold zero is 0.630" i.e. rotor short by 0.006" (ALSTOM equivalent -0.006" rotor contracted).

Data retrieved from the logging system indicated that, with the machine on turning gear just prior to lighting the boiler, the HP DE was indicating a value of 0.600" (bearing in mind that the rotor position within the thrust clearance of 0.017" is not known). The GE cold zero is 0.630" i.e. rotor long by 0.030" (ALSTOM equivalent +0.030" rotor expanded).

The above assessment provided some confidence that the DE instrument was providing sufficiently accurate information to support safe operation of the machine without the need for calibration.

7. RETURN TO SERVICE

Saturday 29th March 2003

20:50 hours. Turning on steam. Vacuum had been raised some hours previously and the HP turbine was therefore already pre-warmed prior to starting the run up procedure. The station normal cold start practice was observed during run up to synchronous speed which was achieved without incident, and the generator synchronised at 23:00 hours the same day.

23:00 hours. Vibration levels at 3600 rpm

Bearing	T1	1.8	Mils peak to peak (standard mounted shaft riders)
	T2	1.7	
	T3	5.0	
	T4	3.5	
	T5	1.3	

Sunday 30th March 2003

After synchronising, the load was held at around 45 MW for some 7 to 8 hours due to the HP rotor/standard differential expansion being in alarm – rotor expanding (rotor long). The maximum value reached was 0.230 mils (ALSTOM equivalent + 0.400" RE), which is the advise trip level. It was understood from IPSC operations personnel that this is not unusual for a cold start. Load was increased to 85 MW from this point and held for a further 2 hours before raising to high load at normal loading rates.

During this period of high HP rotor/standard differential expansion attempts were made to grease both the front and centre standard sliding supports. This proved ineffective on the front standard as the grease ways were blocked i.e. instead of grease appearing from the return line telltales at the front of the standard, it emerged instead from under the rear of the support packers close to the supply line inlet point at the rear of the standard. This suggested that the standard may be tilted and that free expansion of the standard was impeded by lack of lubrication.

The grease lines for the centre (thrust) standard were found to be incorrectly piped and again it was not possible to satisfactorily grease the support packers. Problems at this standard would not be associated with the HP differential expansion difficulties, and this information is reported for completeness.

The standard sliding support system had not been subject to any maintenance during this outage.

14:16 hours 650 MW

Bearing	T1	3.7	Mils peak to peak (standard mounted shaft riders)
	T2	0.5	(T2 suspect reading)
	T3	3.4	
	T4	3.0	
	T5	1.3	

15:34 Unit trip from 815 MW due to a boiler control system fault.

Adjustment made to balance weights by IPSC

Monday 31st March 2003

04:45 hours Resynchronised

500 MW (heatsoaked)

Bearing	T1	2.6	Mils peak to peak (standard mounted shaft riders)
	T2	1.8	(T2 reading now valid)
	T3	3.4	
	T4	1.3	
	T5	1.2	

HP Differential expansion 0.443" (ALSTOM equivalent +0.187")

IP Differential expansion 0.507"

HP outer shell midlength temperature – top 674 deg F

HP outer shell midlength temperature – bottom 780 deg F ΔT -106 °F

At this point the writer left site.

It is understood from site that further attempts at balance improvement have been made. The current information reported from site is:-

Thursday 8th May 2003

952 MW (heatsoaked)

Bearing	T1	1.3	Mils peak to peak (standard mounted shaft riders)
	T2	1.9	
	T3	3.0	
	T4	1.9	
	T5	1.4	

HP Differential expansion 0.451" (ALSTOM equivalent +0.179")

IP Differential expansion 0.488"

HP outer shell midlength temperature – top 685 deg F)

HP outer shell midlength temperature – bottom 736 deg F) ΔT -51 °F

The contractual performance test was carried out 16th & 17th April 2003 with a satisfactory result (0.45 % better than guarantee).

8. RECOMMENDATIONS

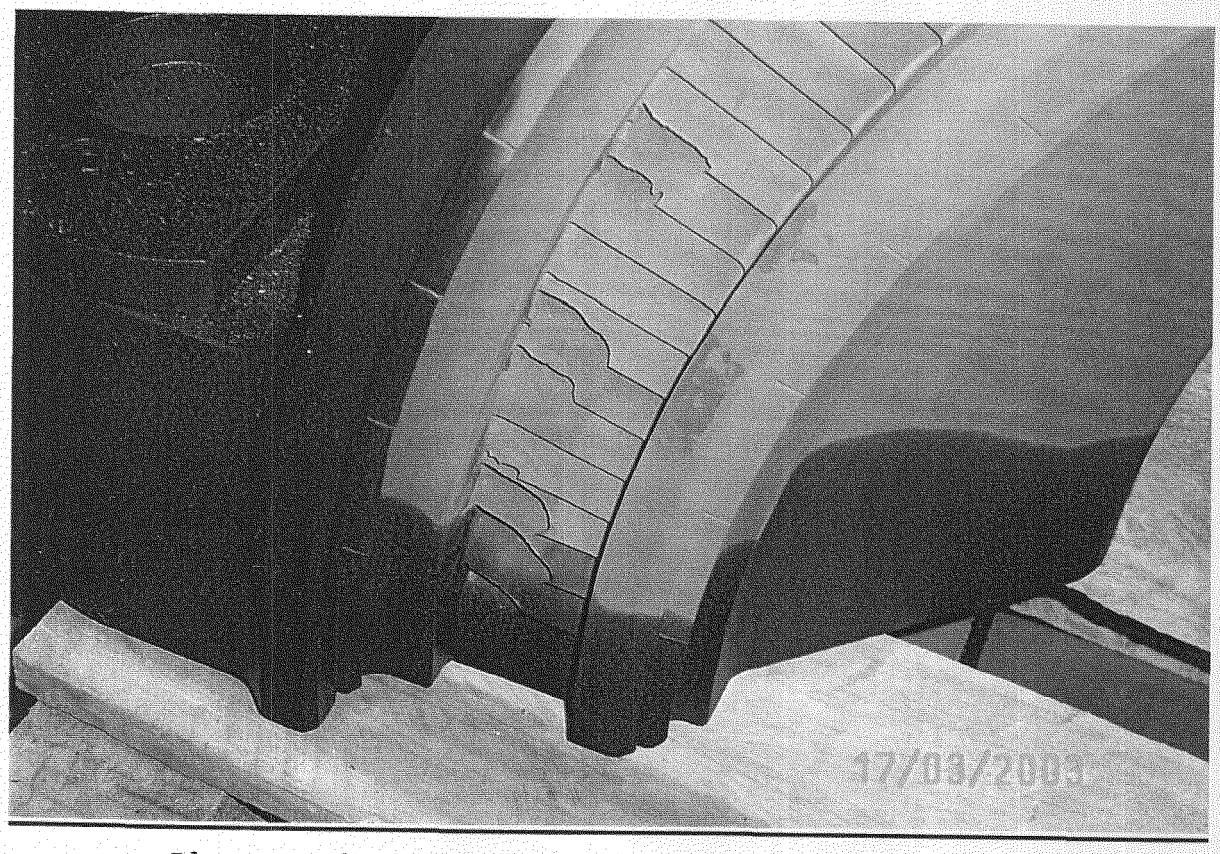
1. **Standard lubrication** – Difficulties with HP differential expansion (rotor long) during cold and warm start ups are not helped when the front bearing standard is unable to expand freely. At the first practical opportunity the standard supports should be removed for cleaning and examination. The grease lines should be cleared and charged with the recommended grade of grease. Greasing should be carried out at suitable intervals i.e. in line with the operating/maintenance manual.

   Should standard expansion be considered a significant problem there are modifications which can be made to sliding surfaces. The current ALSTOM system uses DU material which has proved very successful.

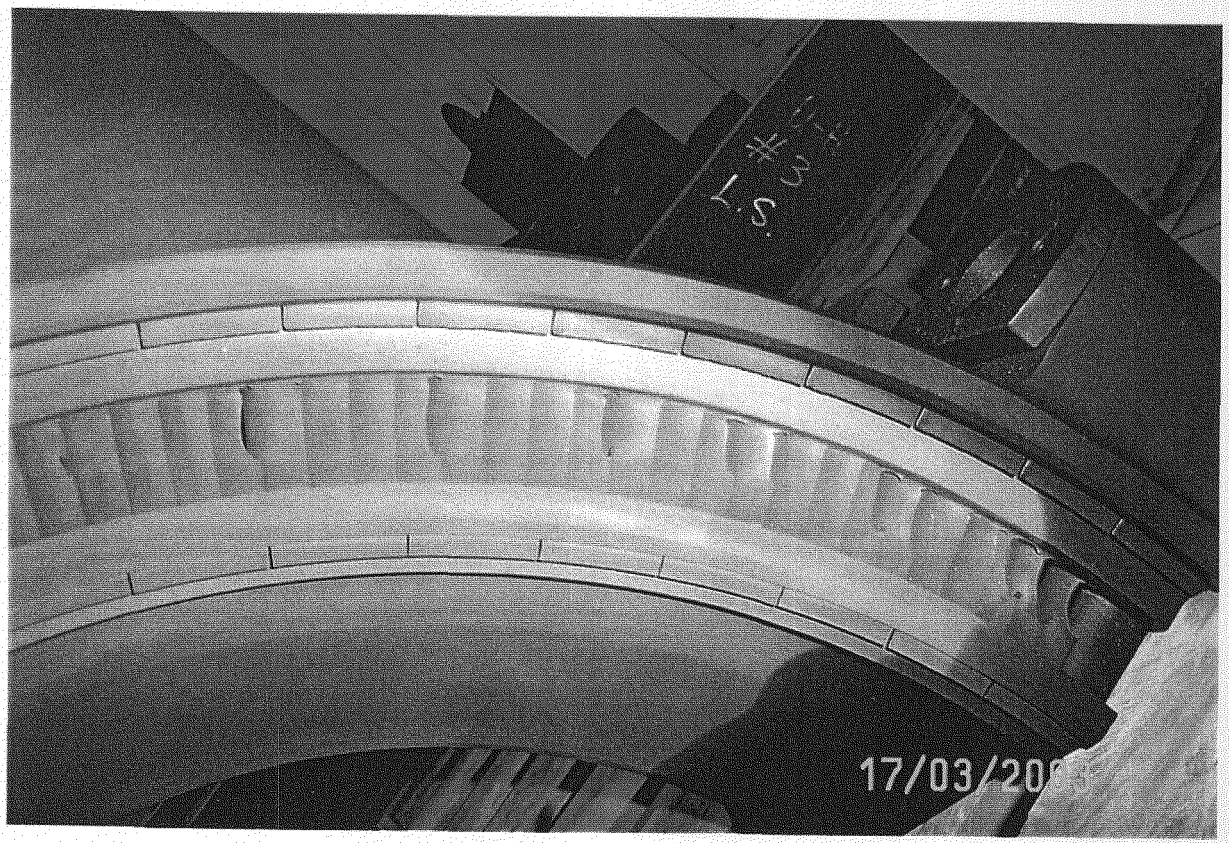
2. **TSE HP DE –** It is of some concern that there is some 0.1" difference in the HP rotor to standard differential expansion between units 1 and 2. The reason for this is not clear. To try and understand this better, and in view of the fact that the instrument on Unit 1 (and perhaps also Unit 2 ?) have not been calibrated, it is recommended that both instruments are calibrated at the first opportunity. Actual differential expansion can be verified whenever access can be gained to the front standard to measure the axial datum. This can then be compared to the cold datum. Refer to the rebuild checklist for each unit for datum location, and for the cold datum values. Measurements should be taken with the rotor pushed onto the thrust pads (rotor towards the front standard), and

push/pull key clearances accounted for (refer to OEM instructions). The instrument can then be adjusted to reflect the figures resulting from the mechanical measurements. With accurate data available further assessment can be made.

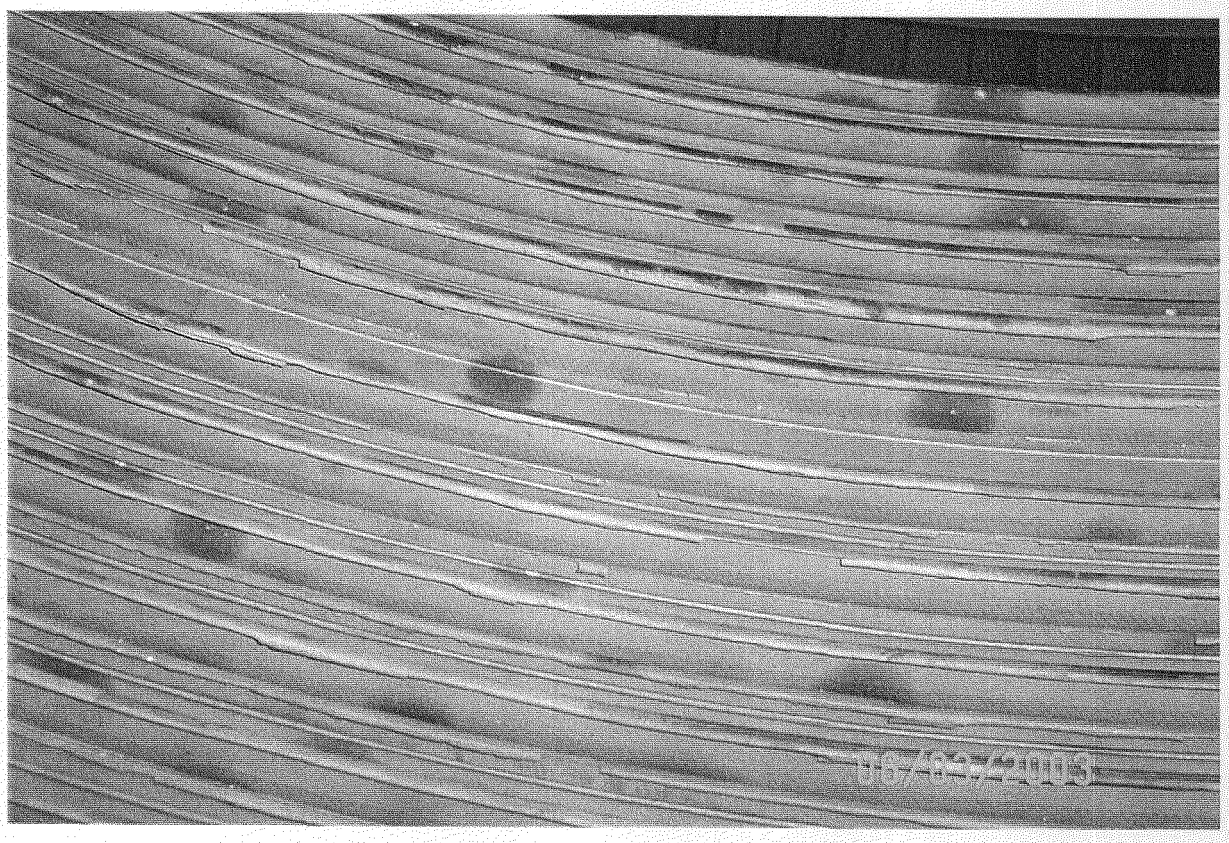
9. PHOTOGRAPHS



Photograph 1 – TYPICAL CONDITION OF OLD NOZZLE



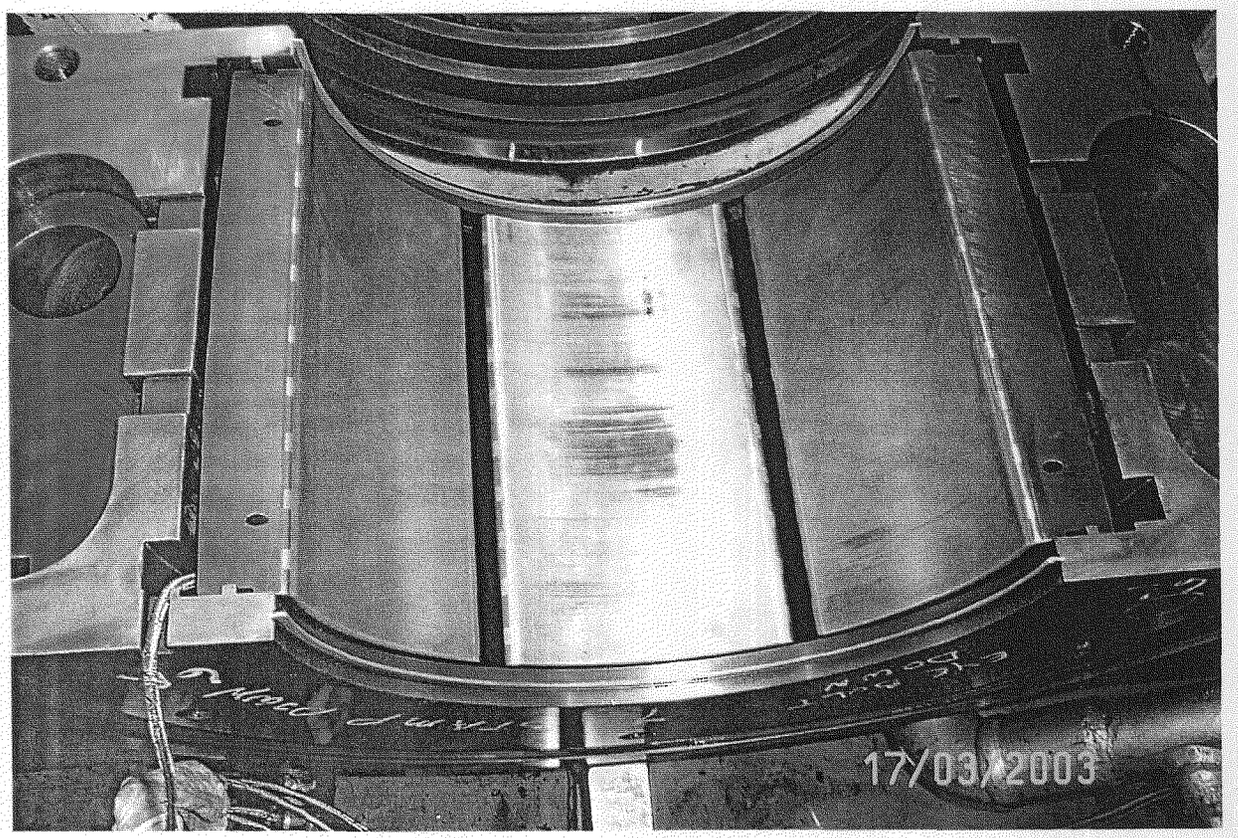
Photograph 2 - TYPICAL CONDITION OF OLD NOZZLE



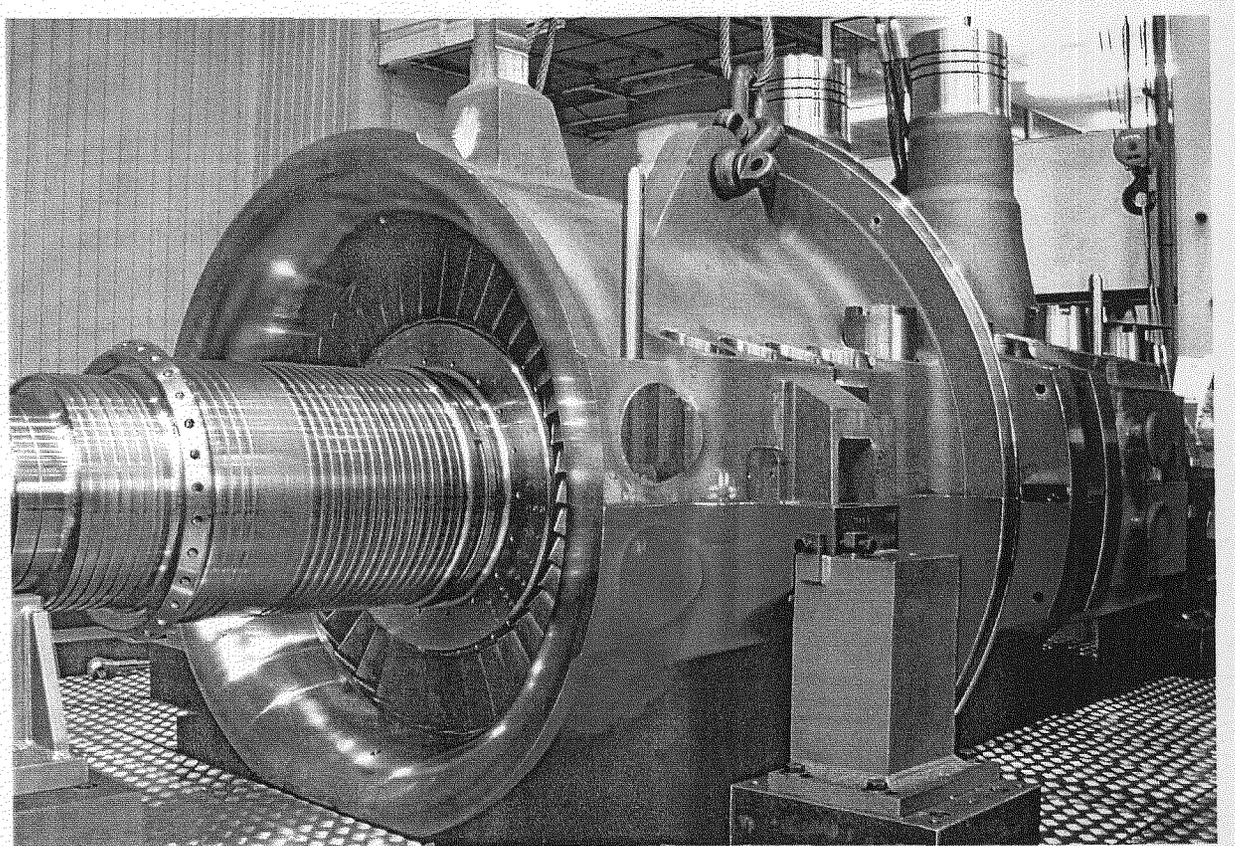
Photograph 3 – OLD INLET GLAND SHOWING HEAVY BOTTOM RUBS

#

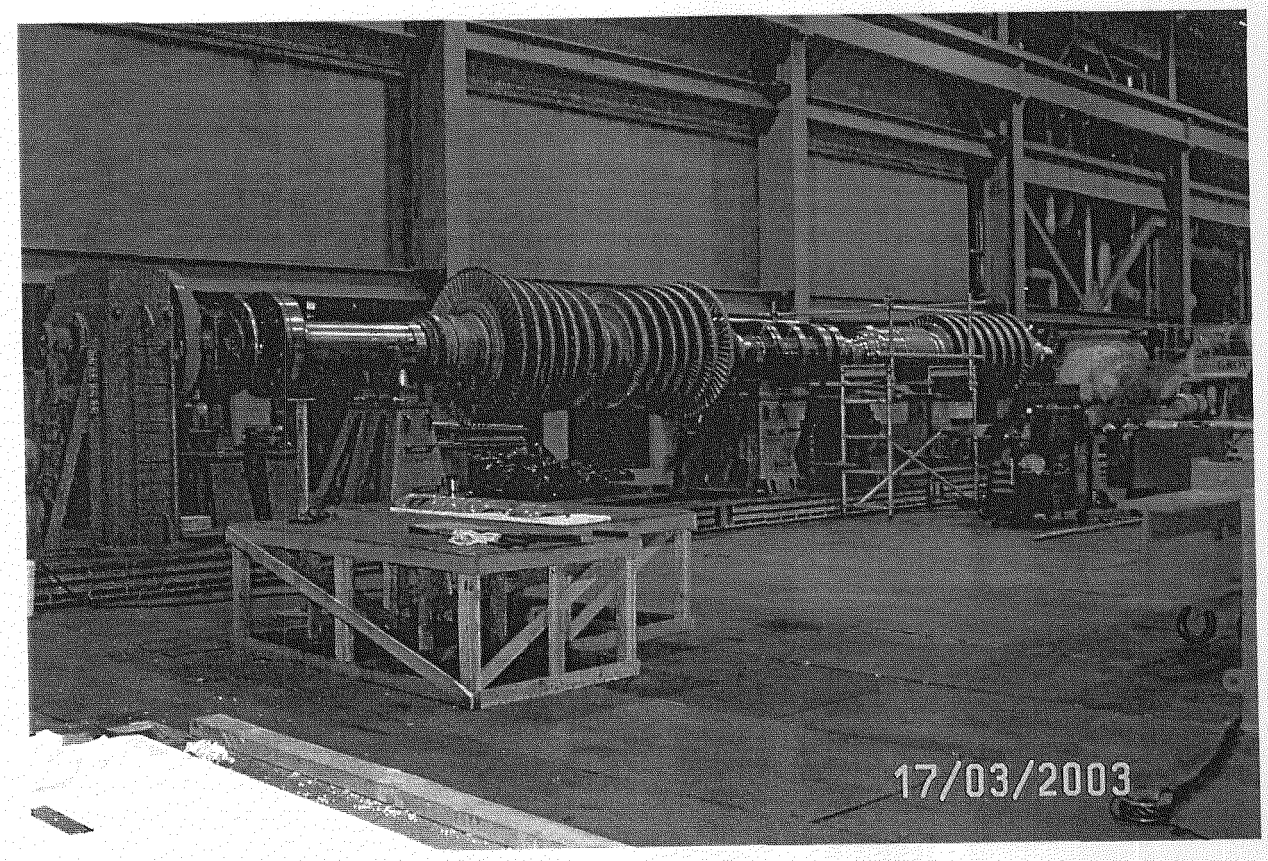
Photograph 4 – HP FRONT BEARING T1 (RE-USED)



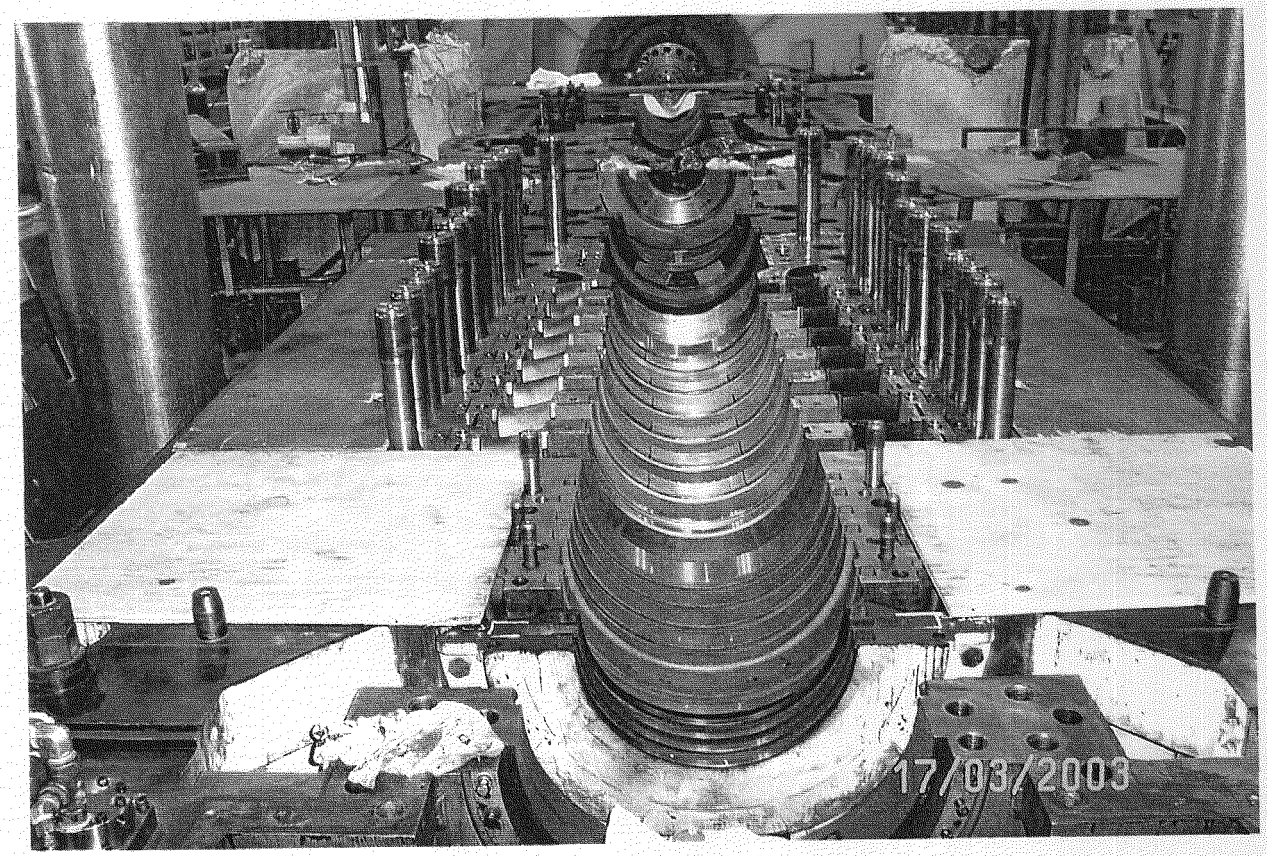
Photograph 5 – HP REAR BEARING T2 (RE-USED)



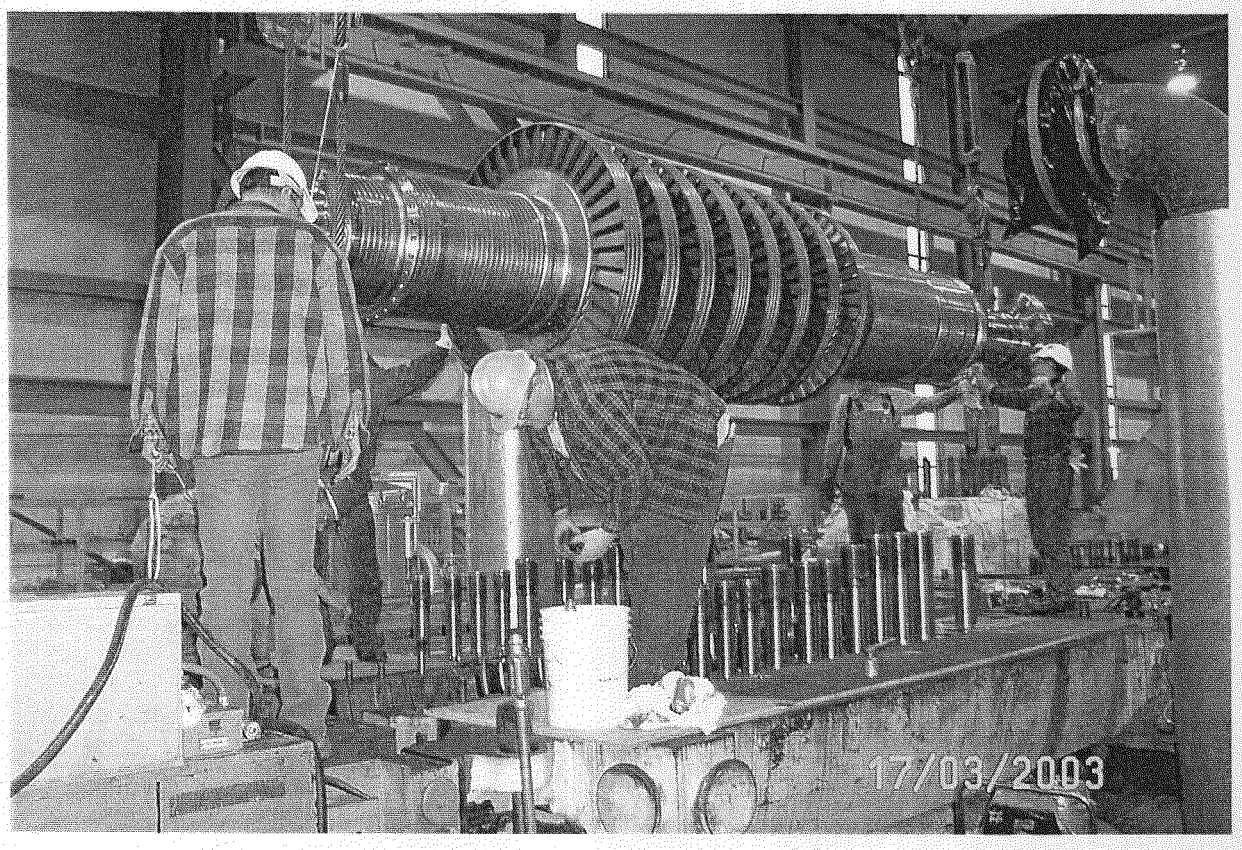
Photograph 6 – REPLANT MODULE AT RUGBY WORKS



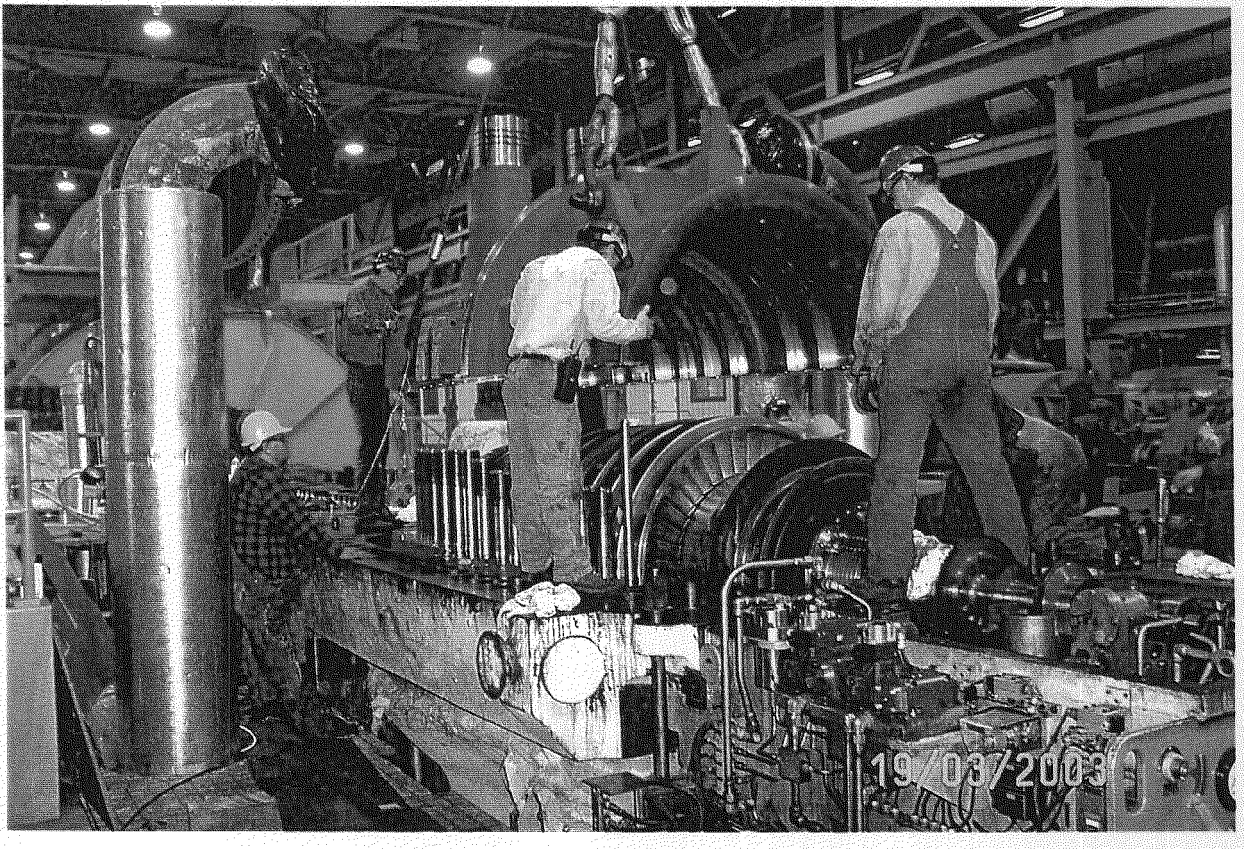
Photograph 7 – SETTING CONCENTRICITY, HP AND IP ROTORS IN LATHE



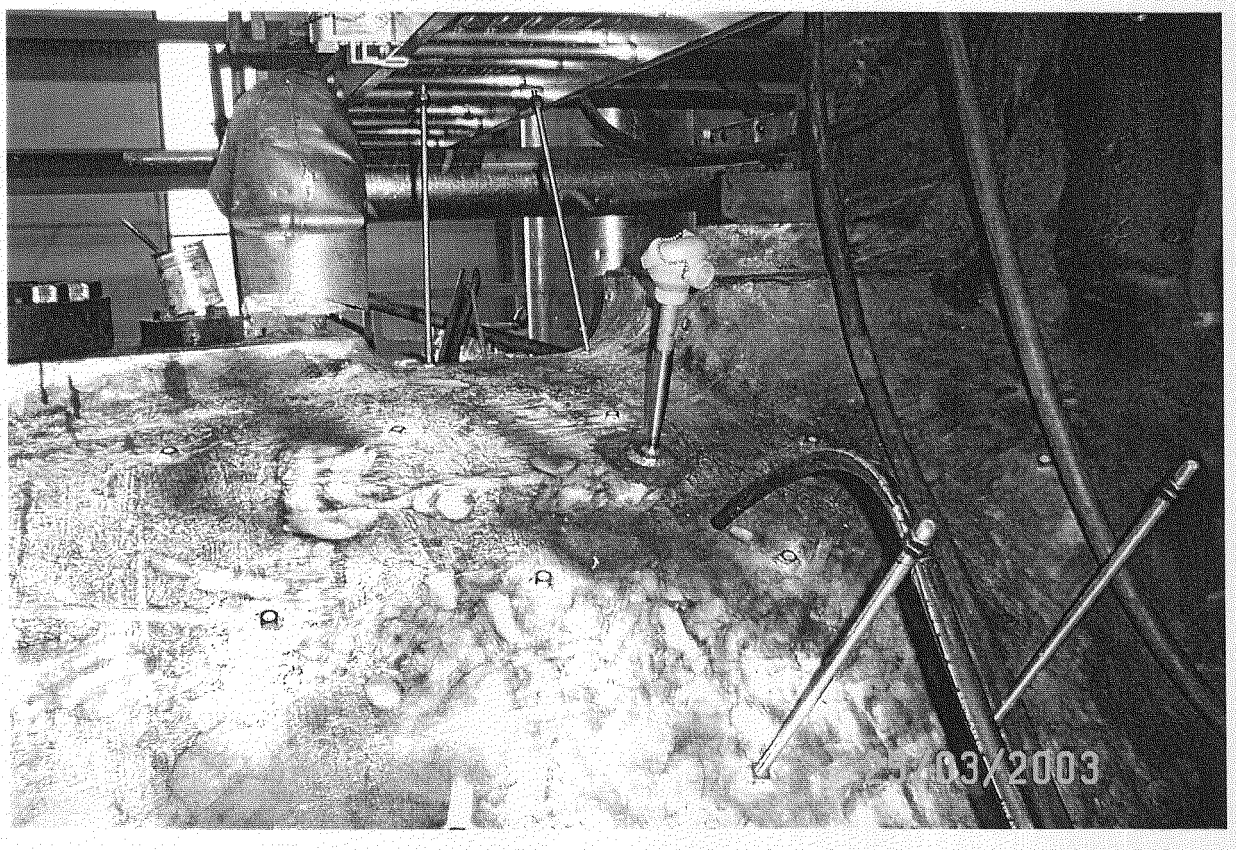
Photograph 8 – BOTTOM HALF INNER CYLINDER IN PLACE



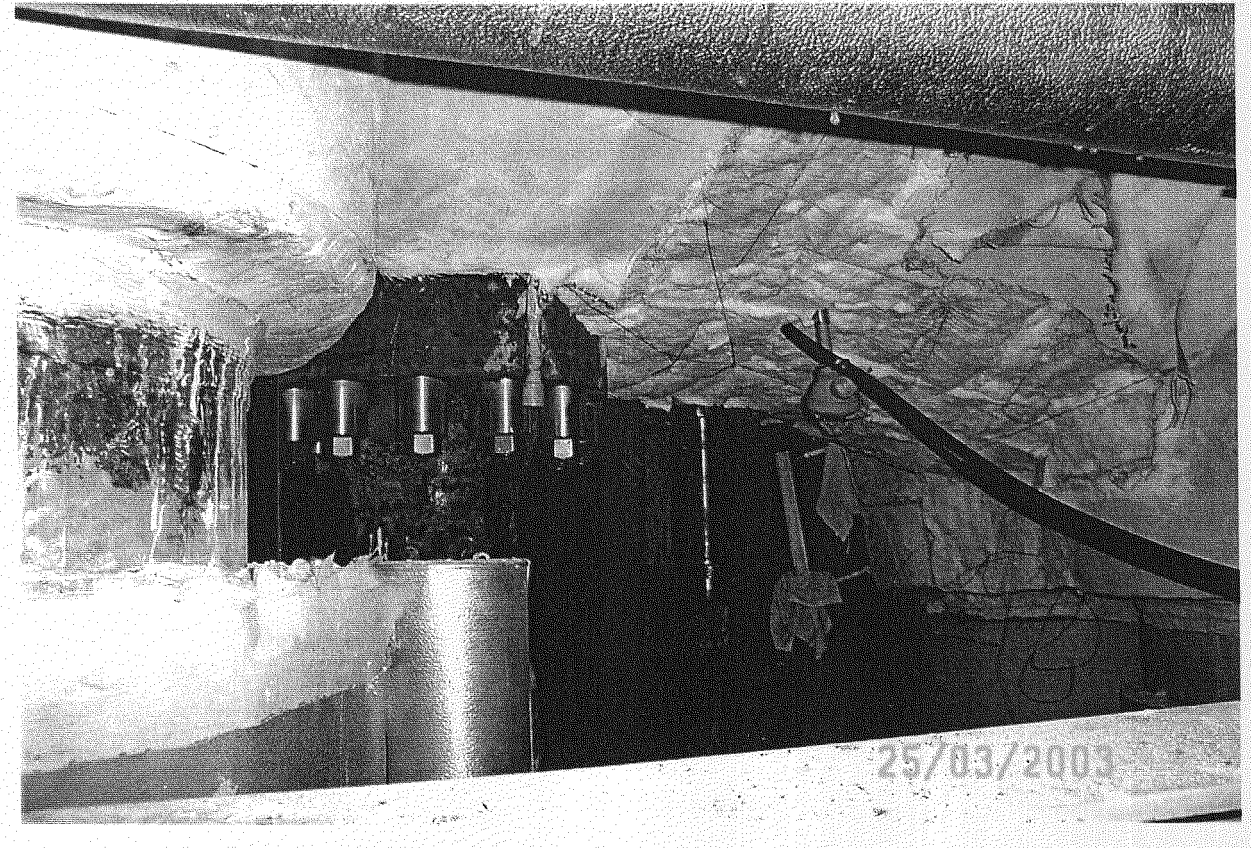
Photograph 9 – ROTOR FINAL ASSEMBLY



Photograph 10 – INNER CYLINDER TOP HALF FINAL FIT



Photograph 11 – OUTER CYLINDER TOP HALF MID LENGTH THERMOCOUPLE



Photograph 12 – OUTER CYLINDER BOTT HALF MID LENGTH THERMOCOUPLE

Appendix 1

BASED ON N1G2 — N2G13 LINE

		TOPS OFF --> TOPS ON SHIFTS						
		INTERMOUNTAIN POWER - UNIT #1						
		HP SECTION						
		Note -- +# For Hor = Right				Note -- +# For Vert = Up		
LOCATION	DISTANCE	HOR OFF	HOR ON	HOR SHIFT		VERT OFF	VERT ON	VERT SHIFT
T1 Bore	-11	23	24	2		12	9	-4
N1 G1	-6	3	4	1		6	4	-3
N1 G2	0	0	0	0		0	0	0
N1 G3	4	2	4	2		12	4	-8
N1 G4/5	16	2	0	-2		18	4	-14
N1 G7	29	2	-1	-3		26	8	-18
8	44	-6	-2	5		-4	-20	-16
5	70	-4	0	4		-6	-21	-14
2	105	-4	-3	1		-3	-16	-13
Nozzle Bore	111	2	4	1		-7	-20	-13
N2 G1	126	2	2	1		-5	-17	-12
N2 G7	149	2	1	-1		-6	-16	-10
N2 G8	153	0	0	0		1	0	-1
N2 G9/10	160	-2	-2	0		6	5	-1
N2 G11	168	-2	-2	0		11	8	-3
N2 G13	179	0	0	0		0	0	0
OD 2	183	4	1	-3		-16	-35	-19
T2 Bore	192	5	4	0		-16	-34	-18

BASED ON T1 BORE —— T2 BORE LINE

		TOPS OFF --> TOPS ON SHIFTS					
		INTERMOUNTAIN POWER - UNIT #1					
		HP SECTION					
		Note -- +# For Hor = Right			Note -- +# For Vert = Up		
LOCATION	DISTANCE	HOR OFF	HOR ON	HOR SHIFT	VERT OFF	VERT ON	VERT SHIFT
T1 Bore	-11	0	0	0	0	0	0
N1 G1	-6	-20	-20	-1	-5	-4	2
N1 G2	0	-22	-23	-2	-11	-6	5
N1 G3	4	-20	-19	0	2	-2	-3
N1 G4/5	16	-18	-22	-4	9	1	-8
N1 G7	29	-18	-22	-4	20	8	-12
8	44	-24	-21	3	-9	-17	-8
5	70	-19	-17	3	-7	-12	-5
2	105	-16	-16	1	1	0	-1
Nozzle Bore	111	-10	-9	1	-2	-2	-1
N2 G1	126	-9	-9	0	2	3	1
N2 G7	149	-7	-8	-1	5	10	5
N2 G8	153	-8	-9	0	12	26	14
N2 G9/10	160	-10	-10	0	18	33	15
N2 G11	168	-9	-9	0	24	37	13
N2 G13	179	-6	-6	0	15	32	17
OD 2	183	-1	-4	-3	-1	-3	-2
T2 Bore	192	0	0	0	0	0	0

			INTERMOUNTAIN POWER - UNIT #1							
			HP FINAL ALIGNMENTS - TOPS ON							
			3/12/2003 1:00PM							
									Shim +	
					Note: + is Rt & Up				Means Add	
	LOCATION	DIST.	IDEAL		CORRECTED		SIDE	ELEV	SHIM	SHIM
			Hor	Vert	Hor	Vert	MOVE	MOVE	LEFT	RIGHT
	N1 G2	0	0	0	0	0	0	0	0	0
	N2 G13	179	0	0	0	0	0	0	0	0
Status										
	N1 G2	0	0	0	0	0	0	0	0	0
	N1 G3	4	0	-1	4	4	-4	-5	-8	-1
	N1 G4/5	16	0	-2	0	4	0	-6	-5	-6
	N1 G7	29	0	-3	-1	8	1	-11	-10	-12
	8	44	0	-5	-2	-20	2	15	17	13
	5	70	0	-6	0	-21	0	15	15	14
	2	105	0	-6	-3	-16	3	10	13	7
	Nozzle Bore	111	0	-6	4	-20	-4	14	10	17
	N2 G1	126	0	-5	2	-17	-2	12	10	14
	N2 G7	149	0	-3	1	-16	-1	13	12	13
	N2 G8	153	0	-2	0	0	0	-2	-2	-2
	N2 G9/10	160	0	-1	-2	5	2	-6	-4	-9
	N2 G11	168	0	0	-2	8	2	-8	-6	-10
	N2 G13	179	0	0	0	0	0	0	0	0

		BUILDING KEYS —> RUNNING KEYS SHIFTS						
		INTERMOUNTAIN POWER - UNIT #1						
			HP SECTION					
		Note – +# For Hor = Right				Note – +# For Vert = Up		
LOCATION	DISTANCE	HOR BUILD	HOR RUN	HOR DIFF.		VERT BUILD	VERT RUN	VERT DIFF.
T1 Bore	-11	0	0	0		0	0	0
N1 G2	0	-23	-23	0		-6	-12	-6
N2 G13	179	-6	-7	-1		32	26	-5
T2 Bore	192	0	0	0		0	0	0

ALSTOM
Power

CUSTOMER SERVICE
TECHNICAL SERVICE SECTION

CHECKLIST REFERENCE NO.

1175

CONTRACT: **INTERMOUNTAIN**

UNIT NUMBER: **1**

ST NUMBER: **11246**

COMPLETED COPY

SECTIONS 1 - 8

THE ENCLOSED DOCUMENTS FORM A RECORD OF MEASUREMENTS TAKEN DURING STRIPDOWN / REBUILD OF THE MACHINE IDENTIFIED ABOVE

IP7_006211

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CUSTOMER SERVICE
TECHNICAL SERVICE SECTION

CHECKLIST REFERENCE NO.

1175

CONTRACT: **INTERMOUNTAIN**

UNIT NUMBER: **1**

ST NUMBER: **11246**

Signed: W H Falconer for Stripdown

Signed: W H Falconer for Rebuild

THE ENCLOSED DOCUMENTS FORM A RECORD OF MEASUREMENTS TAKEN DURING STRIPDOWN / REBUILD OF THE MACHINE IDENTIFIED ABOVE

ALSTOM
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CUSTOMER SERVICE
TECHNICAL SERVICE SECTION

CHECKLIST SECTION INDEX

Checklist No. **1175**

SECTION	TITLE
1	QUALITY PLAN
	TURBINE STRIPDOWN
2	HP CYLINDER
3	Not used
4	Not used
	TURBINE REBUILD
5	HP CYLINDER WORKS BUILD
6	HP CYLINDER SITE BUILD
7	HP CYLINDER MACHINING DATA
8	COUPLINGS

FIELD QUALITY PLAN PAGE 1 of 1

PLAN TYPE: OVERHAUL
CONTRACT PLAN No: IM/01/001
CONTRACT NAME: INTERMOUNTAIN
PREPARED BY: W.H. FALCONER
ISSUE DATE : FEBRUARY 2003
TITLE: 2003 HP REPLANT
UNIT No: 1
REVISION: A FEBRUARY 2003

APPROVAL REFERENCE ABBREVIATIONS :-
A = Approval required
H = Hold point
R = Review required
C = Copy of document required
I = In-process check
S = Surveillance
E = Examine cert./document
N = Notify readiness for test
X = Originator of Inspn/document

NOTE : Prior to commencement of any section of the following Field Quality Plan, reference documents and acceptance standards, identified in columns 6 & 7, must be verified as the current issues.

NO.	COMPONENT/ACTIVITY	REQUIREMENT	TYPE OF CHECK	QUANTITY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	RECORD FORMAT	AGENCY				REMARKS	DWG REV
								SUB	ALST	CUST			
1	TURBINE CHECKLIST (STRIPDOWN AND REBUILD)	CLEARANCE CHECKS	MEASUREMENT	100%	N/A	MACHINE DRAWINGS	CHECKLIST REF No. 1175		X I S A	C		SECTIONS 2 to 9	

IP7_006214

ALSTOM

QC 001

CHECK SHEET ISSUE STATUS AND COMPLETION RECORD

CONTRACT **INTERMOUNTAIN** UNIT NO: **1** ST NO: **11246**

CHECKLIST NO: **1175**

SECTION NO: **2** TITLE: **HP CYLINDER - STRIPDOWN** Sheet 1 of 1

PAGE NO	SHEET NO	DESCRIPTION	ISSUE	TS ENGR
2.1	HP20/001	HP Rotor bumping clearance and axial datums	A	
2.2/2.5	PD09/002	Rotor radial bore datums	A	
2.6	HP20/013	HP rotor to Front pedestal axial datum	A	
2.7	PD15/008	HP Rotor to Thrust pedestal axial datum	A	
2.8	PD15/008	IP Rotor to Thrust pedestal axial datum	A	
2.9	HP/CL2	HP Shaft gland box axial clearances - FRONT & REAR	A	
2.10	HP02/005	HP Shaft end gland clearances - Box A (Front)	A	
2.11	HP02/005	HP Shaft end gland clearances - Box B (Front)	A	
2.12	HP02/005	HP Shaft end gland clearances - Box D (Rear)	A	
2.13	HP02/005	HP Shaft end gland clearances - Box E (Rear)	A	
2.14	HP08/001	HP Gland box to cylinder half joint steps - boxes A, B, & E	A	
2.15	HP24/028	HP Inner/Outer cyl half joint steps, axial & side datums	A	
2.16	HP/M12	HP Inner cylinder palm support measurements	A	
2.17/2.18	HP23/010	HP Cylinder Thrust key and paw grip clearances (2 Shts)	A	
2.19	HP23/005	HP Cylinder Thrust key and support packer thicknesses	A	
2.20	HP21/003	HP Cylinder to pedestal centre line key clearances	A	

ALSTOM

RECORD SHEET **HP20/001** Page No. **2.1**

Title **HP ROTOR BUMPING CLEARANCE & AXIAL COLD DATUMS**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **12/02/02** Checked **BI** Check List No. **1175**

Taken by W Gasser Date 4/3/03 Supervisor M Storey Date 4/3/03 Approved [signature] Date 4/3/03

Readings in inches

SHAFT IDENTIFICATION No.:	N/A

CYLINDER CONDITION	INNER BOXED	OUTER BOXED
ROTOR EXPANDING CLEARANCE	N/A	N/A
ROTOR CONTRACTING CLEARANCE	N/A	N/A
TOTAL FLOAT	N/A	N/A

EXTERNAL COLD DATUMS

FRONT-END THROWER TO GLAND	L.H.S.	N/A
	R.H.S.	N/A
REAR-END THROWER TO GLAND 'E'	L.H.S.	N/A
	R.H.S.	N/A

DISTANCE BETWEEN BACK FACE OF HP COUPLING AND T2 BEARING	10.019"
POSITION AT WHICH READING WAS TAKEN	LHS below half join. Rotor on front pads

ALSTOM

RECORD SHEET **PD09/002** Page No. **2.2**

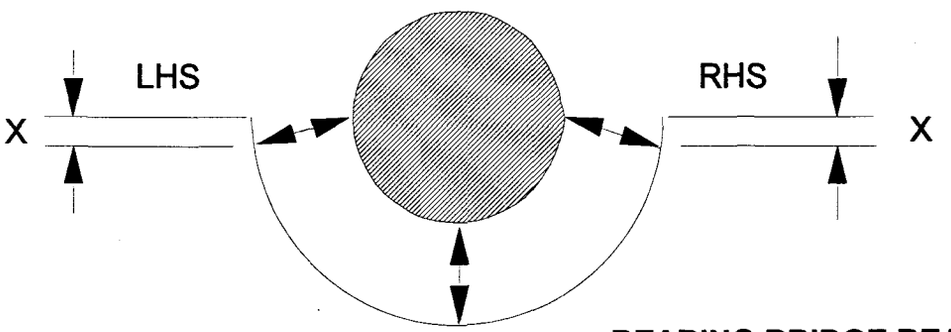
Title **HP ROTOR POSITION RADIAL CHKS -BOXED ON RUNNING KEYS**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **12/02/02** Checked **BI** Check List No. **1175**

Taken by W Gasser Date 3/3/03 Supervisor M Storey Date 3/3/03 Approved W M Storey Date 4/3/03

OLD ROTOR



BEARING BRIDGE READING
T1 1.506
T2 0.464

DIMENSION X = FOR ALL SIDE DATUMS

Type Stamp Identification Letter on the Half Joints, in line with, and close to, the bore being measured from.

Readings in inches

DATUM POSITION		BOXED DATUMS- ON RUNNING KEYS			COMMENTS Bore position
		LHS	BOT/TOP	RHS	
T1 PEDESTAL BORE		7.659	6.547	7.639	
FRONT BOLT-0N GLAND- SEGMENT REMOVED		0.868	0.880	0.888	
CYLINDER BORE - FRONT	TOP HALF	9.633	9.633	9.649	
	BOTT HALF	N/A	N/A	N/A	
CYLINDER BORE - REAR	TOP HALF	8.147	8.1285	8.137	
	BOTT HALF	N/A	N/A	N/A	
**REAR BOLT-0N GLAND- SEGMENT REMOVED		0.877	0.882	0.869	
T2 PEDESTAL BORE		9.989	10.035	10.013	

ROTOR AND CYLINDER VERY HOT.

ALSTOM

RECORD SHEET **PD09/002** Page No. **2.3**

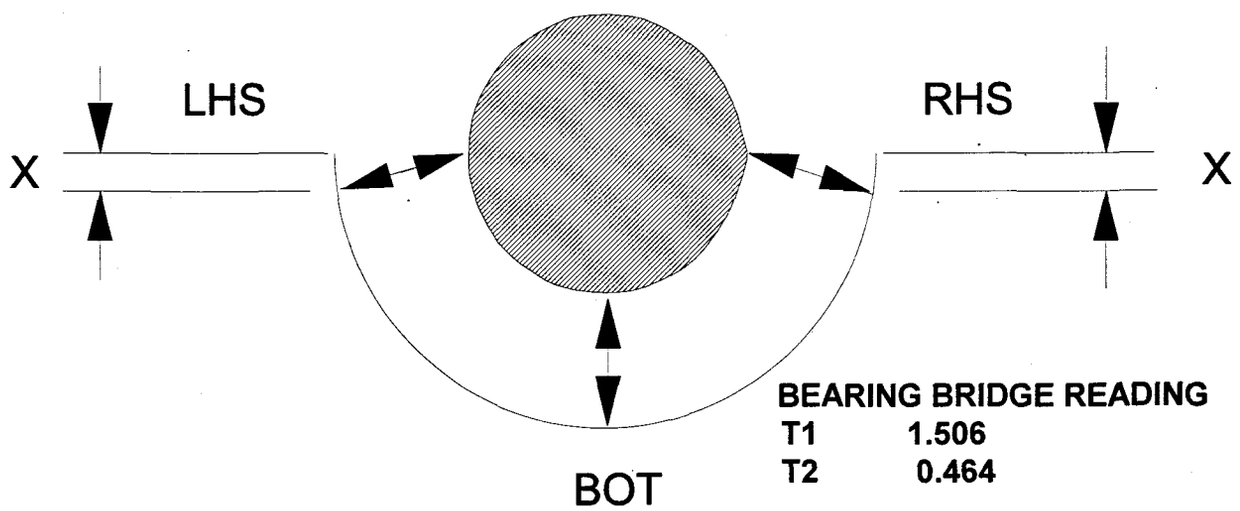
Title **HP ROTOR POSITION RADIAL- ON BUILDING KEYS BOXED**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **12/02/02** Checked **BI** Check List No. **1175**

Taken by W Gasser Date 3/3/03 Supervisor M Storey Date 3/3/03 Approved [signature] Date 4/3/03

OLD ROTOR



BEARING BRIDGE READING
T1 1.506
T2 0.464

DIMENSION X = FOR ALL SIDE DATUMS

Type Stamp Identification Letter on the Half Joints, in line with, and close to, the bore being measured from.

Readings in inches

DATUM POSITION		BOXED DATUMS- ON BUILD KEYS			COMMENTS
		LHS	BOT/TOP	RHS	
T1 PEDESTAL BORE		7.663	6.541	7.641	
*FRONT BOLT-0N GLAND- SEGMENT REMOVED		0.868	0.878	0.887	
CYLINDER BORE - FRONT	TOP HALF	9.633	9.637	9.649	
	BOTT HALF	N/A	N/A	N/A	
CYLINDER BORE - REAR	TOP HALF	8.1425	8.135	8.137	
	BOTT HALF	N/A	N/A	N/A	
*REAR BOLT-0N GLAND- SEGMENT REMOVED		0.873	0.878	0.872	
T1 PEDESTAL BORE		9.991	10.030	10.011	

ROTOR & CYLINDER HOT.

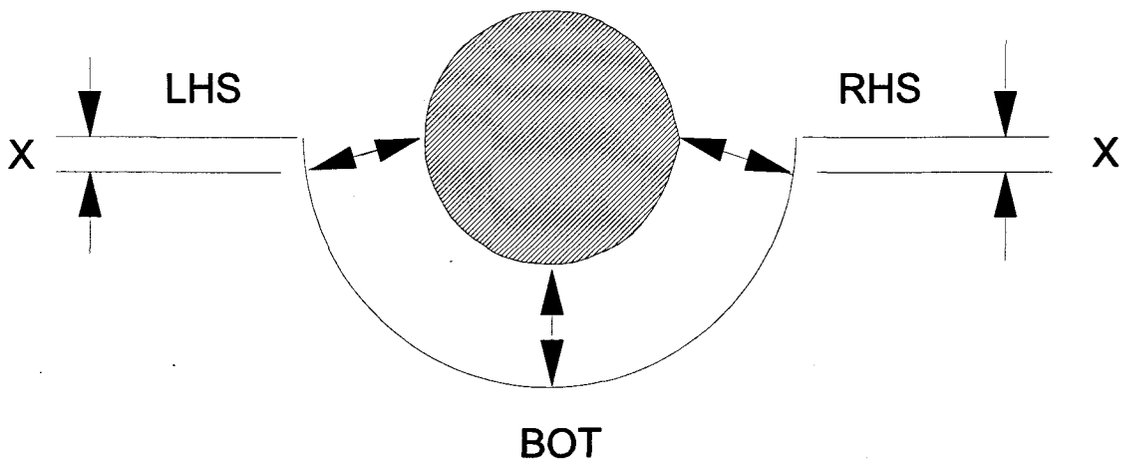
ALSTOM

RECORD SHEET **PD09/002** Page No. **2.4**

Title **HP ROTOR POSIT. RADIAL CHKS -ON BUILDING KEYS UNBOXED**

Contract	**INTERMOUNTAIN**	Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**12/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by	Date	Supervisor	Date	Approved	WHF	Date	7/3/02

OLD ROTOR



DIMENSION X = FOR ALL SIDE DATUMS

Type Stamp Identification Letter on the Half Joints, in line with, and close to, the bore being measured from.

Readings in inches

DATUM POSITION		UNBOXED DATUMS- ON BUILD KEYS			COMMENTS
		LHS	BOTTOM	RHS	
T1 PEDESTAL BORE		N/A	N/A	N/A	
FRONT BOLT-0N GLAND- SEGMENT REMOVED		N/A	N/A	N/A	
CYLINDER BORE - FRONT	TOP HALF	N/A	N/A	N/A	
	BOTT HALF	N/A	N/A	N/A	
CYLINDER BORE - REAR	TOP HALF	N/A	N/A	N/A	
	BOTT HALF	N/A	N/A	N/A	
REAR BOLT-0N GLAND- SEGMENT REMOVED		N/A	N/A	N/A	
T2 PEDESTAL BORE		N/A	N/A	N/A	

ALSTOM

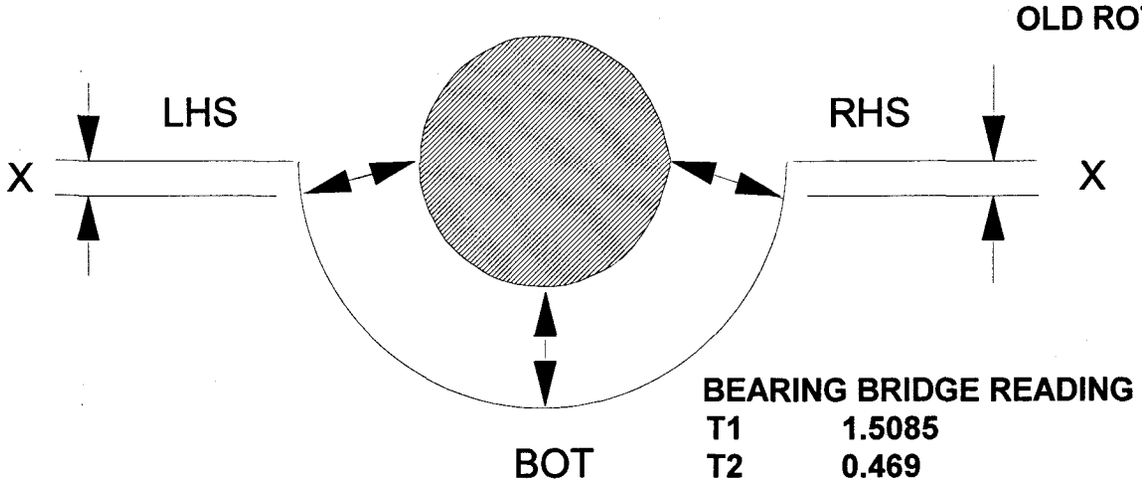
RECORD SHEET **PD09/002A** Page No. **2.5**

Title **HP ROTOR RADIAL BORE DATUMS- UNBOXED, ROTOR CENTRALISED**

Contract	**INTERMOUNTAIN**	Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**12/02/02**	Checked	**BI**	Check List No.	**1175**

Taken by Rick Date 4/3/03 Supervisor B Grierson Date 4/3/03 Approved [signature] Date 4/3/03

OLD ROTOR



BEARING BRIDGE READING

T1	**1.5085**
T2	**0.469**

DIMENSION X = FOR ALL SIDE DATUMS

Type Stamp Identification Letter on the Half Joints, in line with, and close to, the bore being measured from.

Readings in inches

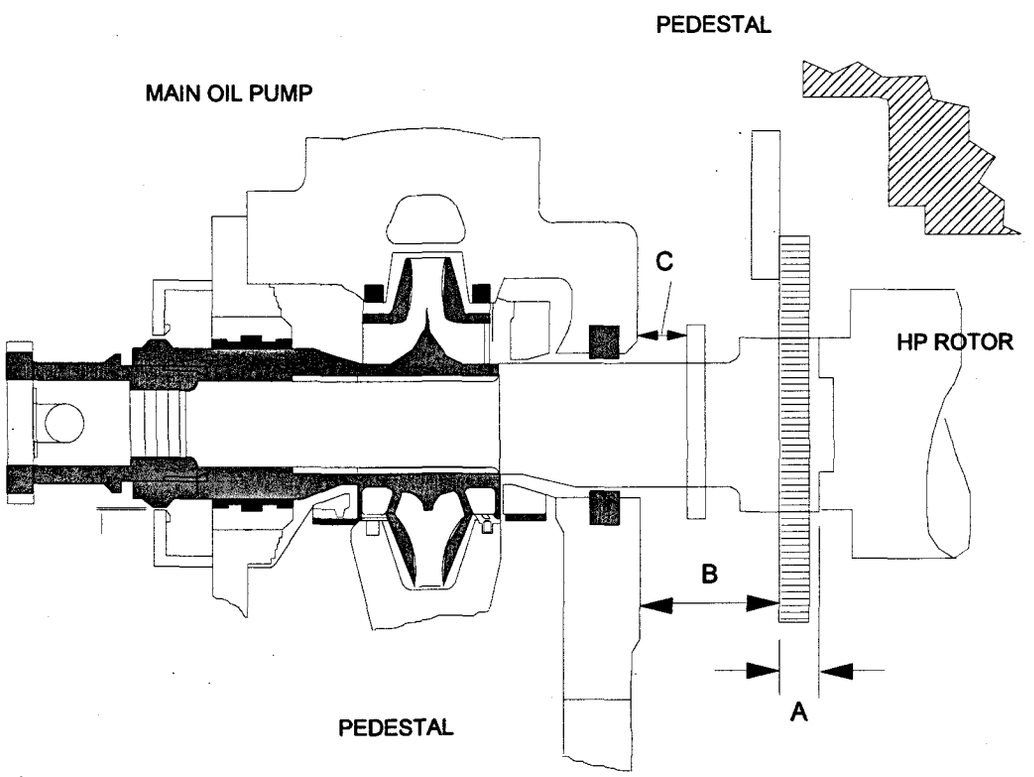
DATUM POSITION		UNBOXED DATUMS- JOURNALS CENTRALISED IN BEARINGS			COMMENTS
		LHS	BOTTOM	RHS	
T1 PEDESTAL BORE		7.661	6.538	7.639	
FRONT BOLT-0N GLAND- SEGMENT REMOVED		0.871	0.879	0.884	
CYLINDER BORE - FRONT	TOP HALF				
	BOTT HALF				
CYLINDER BORE - REAR	TOP HALF				
	BOTT HALF				
REAR BOLT-0N GLAND- SEGMENT REMOVED		0.871	0.895	0.874	
T2 PEDESTAL BORE		9.994	10.033	10.011	

ALSTOM

RECORD SHEET **HP20/013** Page No. **2.6**

Title	**ROTOR TO FRONT PEDESTAL AXIAL DATUM**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by W Gasser	Date 4/3/03	Supervisor M Storey		Date 4/3/03	Approved W.Gasser	Date 5/3/03	

OLD HP ROTOR



ROTOR TO BE IN COLD SET POSITION PUSHED TO **FRONT** Readings in inches

DATUM		POSITION
A	1.472	
B	8.054	LHS
C	1.075	LHS

ALSTOM

RECORD SHEET **PD15/008** Page No. **2.7**

Title **HP ROTOR TO THRUST PEDESTAL AXIAL DATUM**

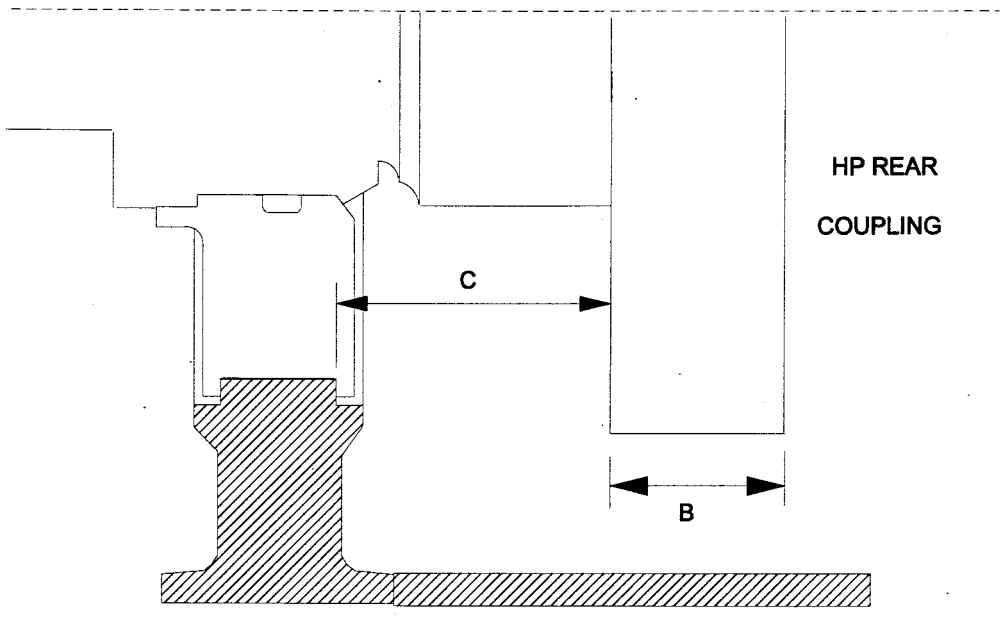
Contract	**INTERMOUNTAIN**	Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**4/3/03**	Checked	**WHF**	Check List No.	**1175**

Taken by W Gasser Date 4/3/03 Supervisor M Storey Date 4/3/03 Approved W Halcrow Date 5/3/03

OLD ROTOR

HP ROTOR AXIAL DATUM

IN THRUST PEDESTAL



ROTORS TO BE IN COLD SET POSITION PUSHED TO THE **FRONT**

Readings in inches

DATUM	OLD ROTOR	POSITION
B	5.747	N/A
C	10.019	LHS

ALSTOM

RECORD SHEET **PD15/008** Page No. **2.8**

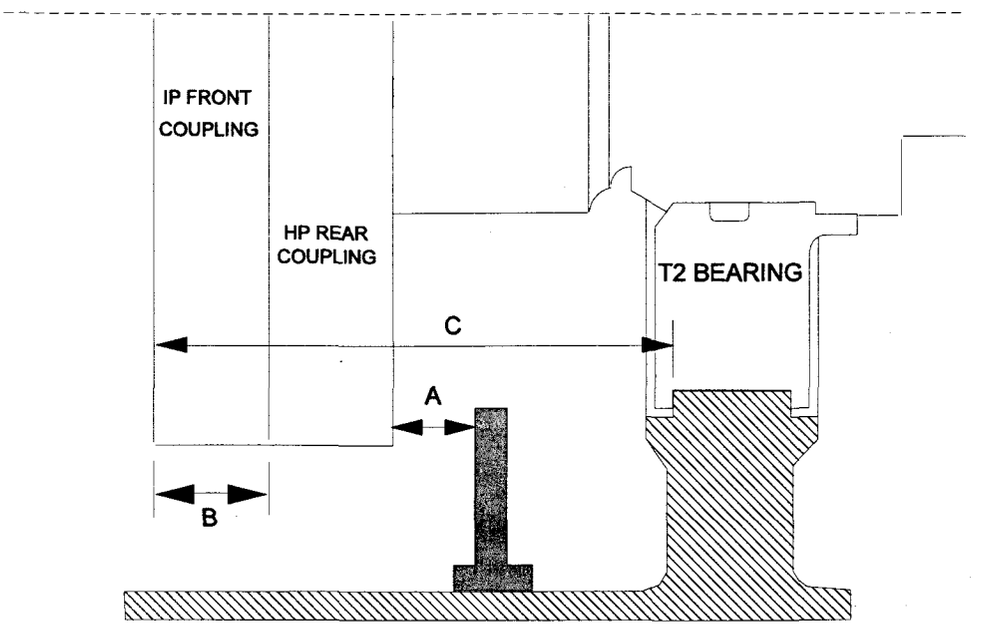
Title	**IP ROTOR TO THRUST PEDESTAL AXIAL DATUM**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**4/3/03**	Checked	**WHF**	Check List No.	**1175**

Taken by W Gasser Date 4/3/03 Supervisor M Storey Date 4/3/03 Approved Date 5/3/03

OLD ROTOR

IP ROTOR AXIAL DATUM

IN THRUST PEDESTAL



ROTORS TO BE IN COLD SET POSITION PUSHED TO THE **FRONT**

Readings in inches

DATUM	OLD ROTOR	POSITION
A	N/A	---
B	N/A	---
C	21.516	LHS

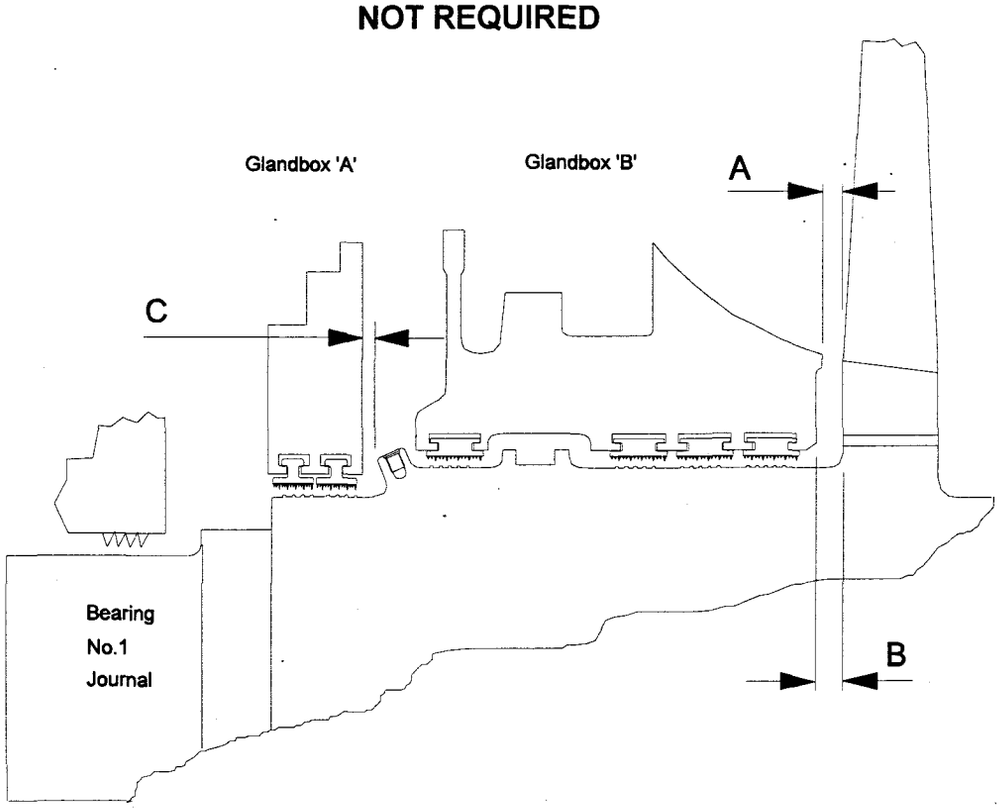
ALSTOM

RECORD SHEET **HP/CL2** Page No. **2.9**

Title	**HP SHAFT GLAND BOX AXIAL CLEARANCES - FRONT & REAR**						
Contract	**INTERMOUNTAIN**			Unit No	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by	Date	Supervisor	Date	Approved		Date	

REF DRAWING :- **OLD ROTOR**

NOT REQUIRED



ROTOR TO 'E' GLAND AXIAL DATUM = __LHS__

ROTOR IN THE COLD SET POSITION PUSHED TO **FRONT**Readings in inches

POSITION	A (RE)	B (RE)	C					
			Front	Rear				
DESIGN	--	--						
LHS	N/A	N/A						
RHS	"	"						

RE = ROTOR EXPANDING CLEARANCE **RC** = ROTOR CONTRACTING CLEARANCE

ALSTOM

RECORD SHEET **HP02/005** Page No. **2.10**

Title **HP SHAFT END GLAND CLEARANCES - BOX A FRONT**

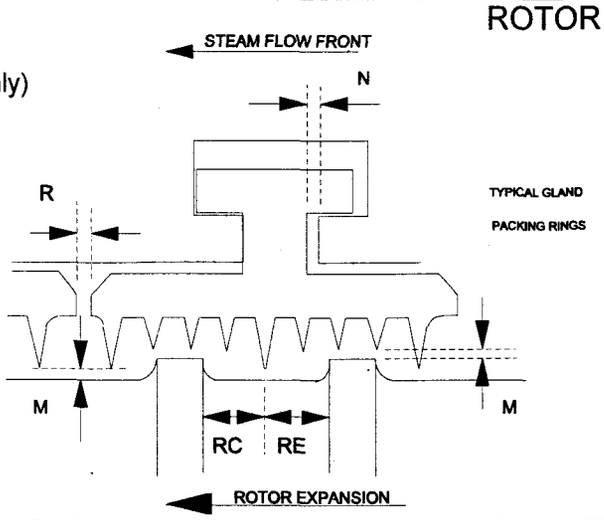
Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by Randy Date 4/3/03 Supervisor B Griers Date 4/3/03 Approved [signature] Date 5/3/03

OLD ROTOR ROTOR AXIAL DATUM = **10.019"**

(Sample readings only)



ALL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM.
RC REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

(F= Front End, R= Rear End) Readings in inches

GLAND RING NO.			A1 F	A2 R
RE (L)	DESIGN		.550	.550
	LHS		.555	
	RHS		.566	
RC (O)	DESIGN		.290	.290
	LHS		.275	
	RHS		.275	
M	TOP	DES	.025	.025
		ACT		
	BOT	DES	.025	.025
		ACT		
	LHS	DES	.025	.025
		ACT		
	RHS	DES	.025	.025
		ACT		
N	DESIGN		----	----
	LHS		N/R	N/R
	RHS		"	"
R	DESIGN		----	----
	LHS		N/R	N/R
	RHS		"	"

ALSTOM

RECORD SHEET **HP02/005** Page No. **2.11**

Title **HP SHAFT CYLINDER GLAND CLEARANCES - BOX B FRONT**

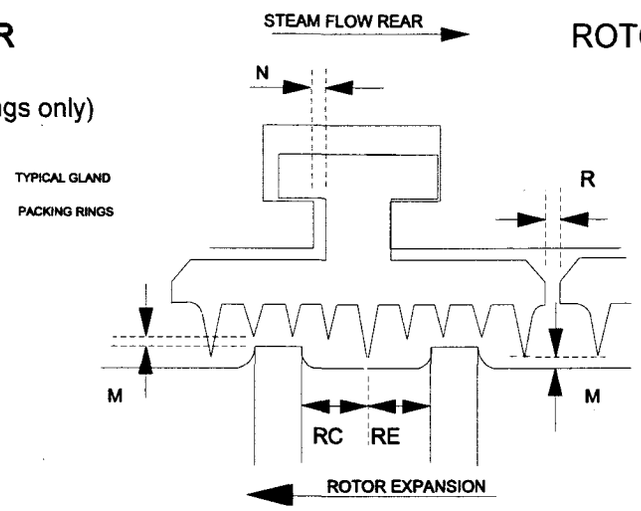
Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by Randy Date 4/3/03 Supervisor B Grierson Date 4/3/03 Approved W.H.Balcomey Date 4/3/03

OLD ROTOR

(Sample readings only)



ROTOR AXIAL DATUM = **10.019"**

ALL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

RC REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

(F= Front End, R= Rear End)

Readings in inches

GLAND RING NO.			B1	B2	B3	B4	B5
RE (L)	DESIGN		.550	.550	.550	.550	.550
	LHS		.540				.548
	RHS		.522				.554
RC (O)	DESIGN		.290	.290	.290	.290	.290
	LHS		.292				.317
	RHS		.310				.312
M	TOP	DES	.020				
		ACT					
	BOT	DES	.020				
		ACT					
	LHS	DES	.020				
		ACT					
	RHS	DES	.020				
		ACT					
N	DESIGN		----	----	----	----	----
	LHS		N/M	N/M	N/M	N/M	N/M
	RHS		"	"	"	"	"
R	DESIGN		----	----	----	----	----
	LHS		N/M	N/M	N/M	N/M	N/M
	RHS		"	"	"	"	"

ALSTOM

RECORD SHEET **HP02/005**

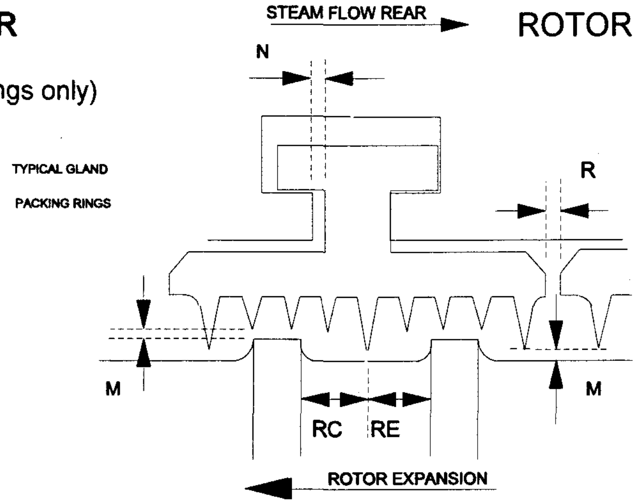
Title	**HP SHAFT CYLINDER GLAND CLEARANCES - BOX D REAR**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**

Taken by Randy Date 4/3/03 Supervisor B Grierson Date 4/3/03 Approved [signature] Date 4/3/03

OLD ROTOR

(Sample readings only)

ROTOR AXIAL DATUM = **10.019"**



ALL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM.
RC REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

(F= Front End, R= Rear End)

Readings in inches

GLAND RING NO.			D1	D2	D3	D4
RE (L)	DESIGN		.180	.180	.180	.180
	LHS		.217			.215
	RHS		.213			.234
RC (O)	DESIGN		.180	.170	.170	.180
	LHS		.095			.116
	RHS		.103			.117
M	TOP	DES	.020	.020	.020	.020
		ACT				
	BOT	DES	.020	.020	.020	.020
		ACT				
	LHS	DES	.020	.020	.020	.020
		ACT				
	RHS	DES	.020	.020	.020	.020
		ACT				
N	DESIGN		----	----	----	----
	LHS					
	RHS					
R	DESIGN		----	----	----	----
	LHS					
	RHS					

ALSTOM

RECORD SHEET **HP02/005** Page No. **2.13**

Title **HP SHAFT END GLAND CLEARANCES - BOX E REAR**

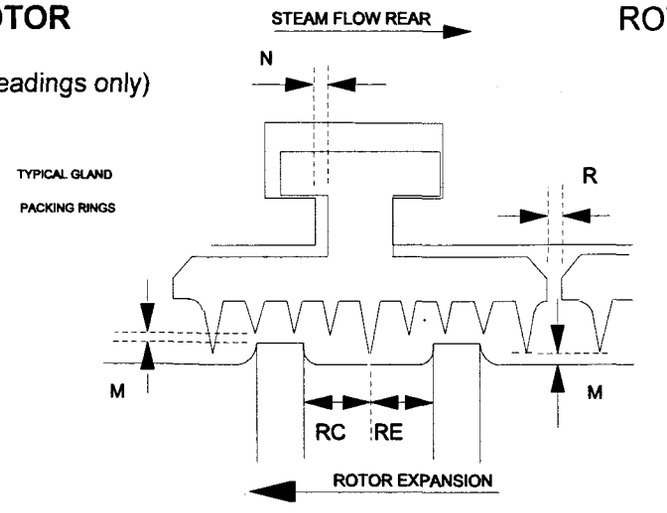
Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by Randy Date 4/3/03 Supervisor BGrierson Date 4/3/03 Approved [signature] Date 4/3/03

OLD ROTOR

(Sample readings only)



ROTOR AXIAL DATUM = **10.019"**

ALL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM.
RC REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

(F= Front End, R= Rear End)
Readings in inches

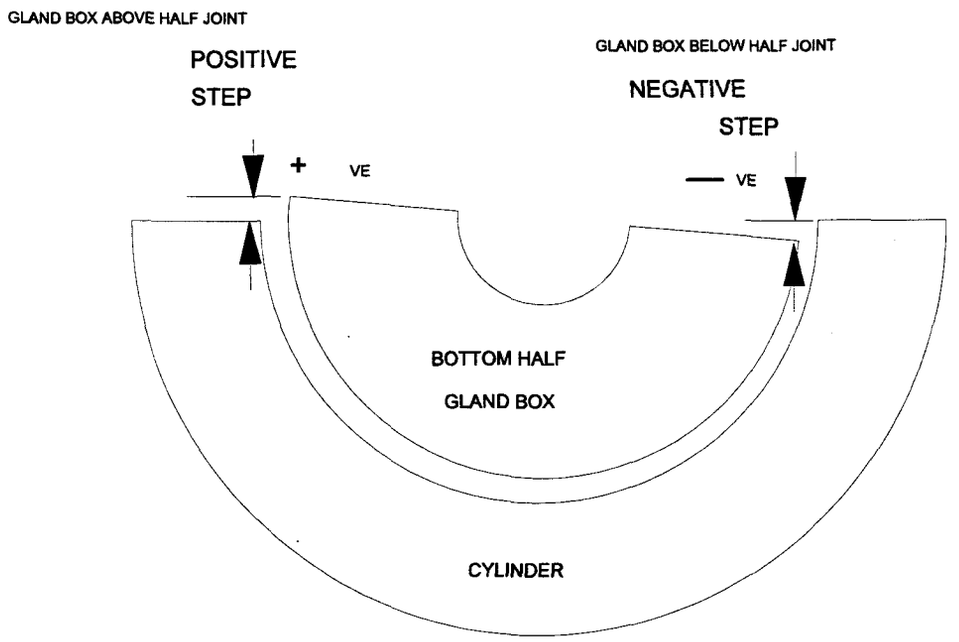
GLAND RING NO.			E1	E2
RE (L)	DESIGN		.175	.175
	LHS			.175
	RHS			.155
RC (O)	DESIGN		.165	.165
	LHS			.156
	RHS			.154
M	TOP	DES	.025	.025
		ACT		
	BOT	DES	.025	.025
		ACT		
	LHS	DES	.025	.025
		ACT		
	RHS	DES	.025	.025
		ACT		
N	DESIGN		-----	-----
	LHS			
	RHS			
R	DESIGN		-----	-----
	LHS			
	RHS			

ALSTOM

RECORD SHEET **HP08/001** Page No. **2.14**

Title	**HP GLAND BOX TO OUTER CYLINDER HALF JOINT STEPS**						
Contract	**INTERMOUNTAIN**			Unit No	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by B Grierson	Date 4/3/03	Supervisor		Date		Approved	Date 5/3/03

EXISTING GLAND BOXES



POSITION AT WHICH READINGS ARE TAKEN TO BE MARKED 'X'

Readings in inches

	BOLT ON GLAND BOX A FRONT CORNER	BOLT ON GLAND BOX A REAR CORNER	EXHAUST GLAND BOX B FRONT CORNER	EXHAUST GLAND BOX B REAR CORNER	BOLT ON GLAND BOX E FRONT CORNER	BOLT ON GLAND BOX E REAR CORNER
LHS	**- 0.010**	N/A	**- 0.005**	**- 0.008**	N/A	**+ 0.028**
RHS	**+ 0.005**	N/A	**- 0.008**	**- 0.010**	N/A	**- 0.024**

NOTE + SIGN TO INDICATE BUSH PROUD OF CYLINDER HALF JOINT
- SIGN TO INDICATE BUSH BELOW CYLINDER HALF JOINT.

ALSTOM

RECORD SHEET **HP24/028** Page No. **2.15**

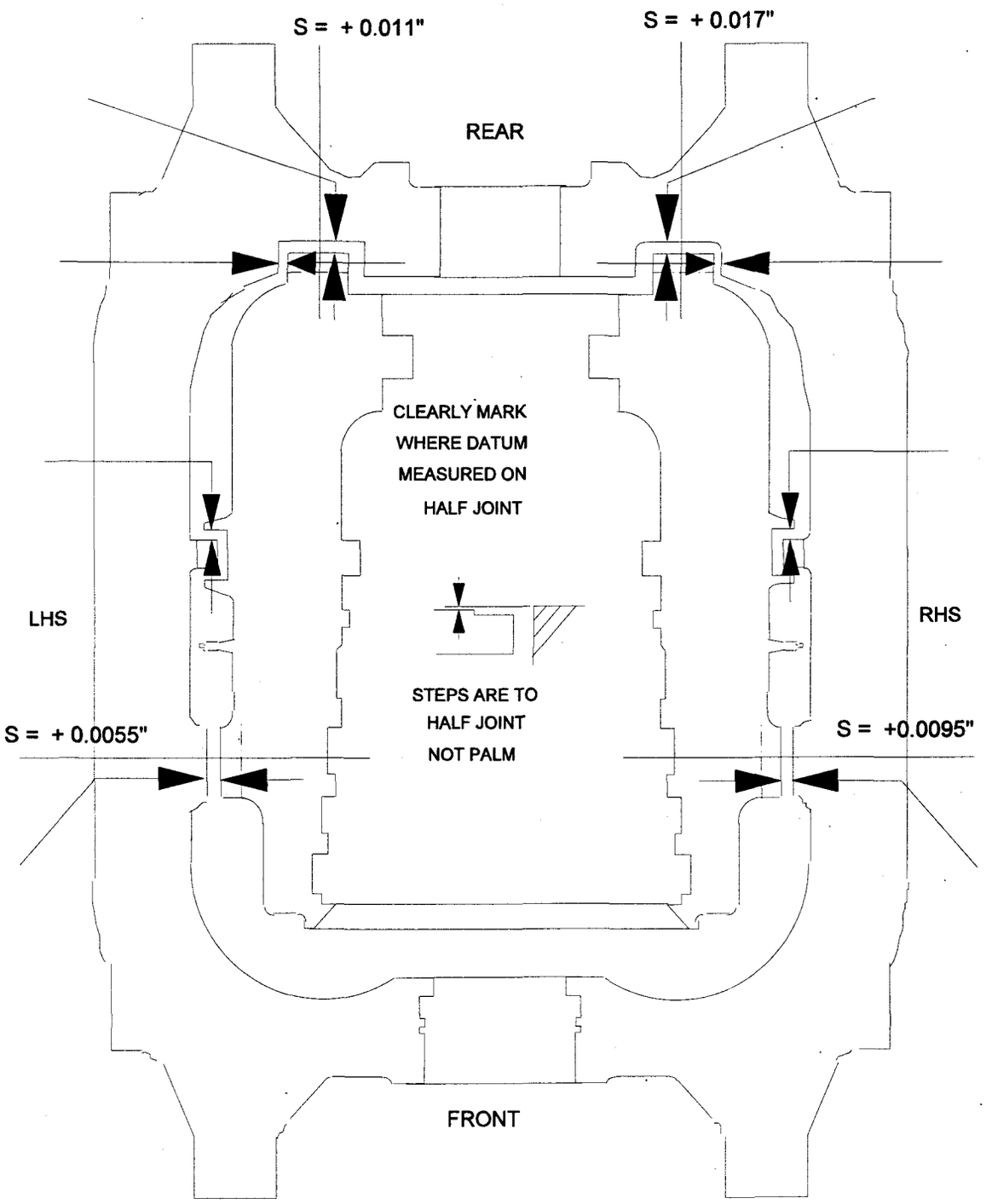
Title	**HP INNER/OUTER CYL HALF JOINT STEPS, AXIAL & SIDE DATUMS**

Contract	**INTERMOUNTAIN**			Unit No	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**

Taken by W Gasser Date 4/3/03 Supervisor M Storey Date 4/3/03 Approved W Hazelgrove Date 5/3/03

OLD INNER CYLINDER

'S' Readings X 0.001"



\+ = INNER HIGHER THAN OUTER

– = INNER LOWER THAN OUTER

S = HALF JOINT STEP

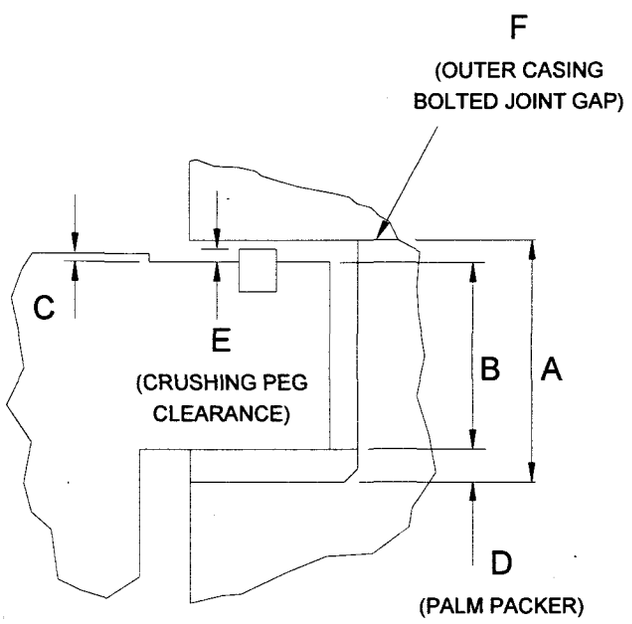
2 - HP CYLINDER - STRIPDOWN

IP7_006230

ALSTOM

RECORD SHEET **HP/M12** Page No. **2.16**

Title	**HP INNER CYLINDER PALM SUPPORT MEASUREMENTS**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by IPSC	Date 5/3/03	Supervisor	BG/MS	Date 5/3/03	Approved		Date 6/3/03



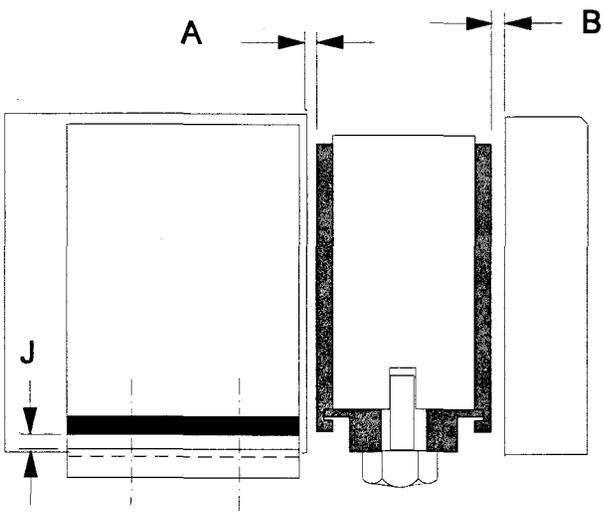
READINGS IN INCHES

POSITION	A RECESS	B PALM OLD CYL. ( ) = NEW CYL.	C PALM OLD CYL. ( ) = NEW CYL.	CALCULATED INITIAL PACKER SIZE	D ACTUAL PACKER SIZE
LHS FRONT	4.633	3.916 (3.960)	0.079 (- 0.042)	0.605	0.632
LHS REAR	4.633	3.922 (3.970)	0.076 (- 0.040)	0.608	0.640
RHS FRONT	4.634	3.912 (3.960)	0.087 (- 0.043)	0.610	0.634
RHS REAR	4.632	3.922 (3.9695)	0.077 (- 0.039)	0.610	0.640

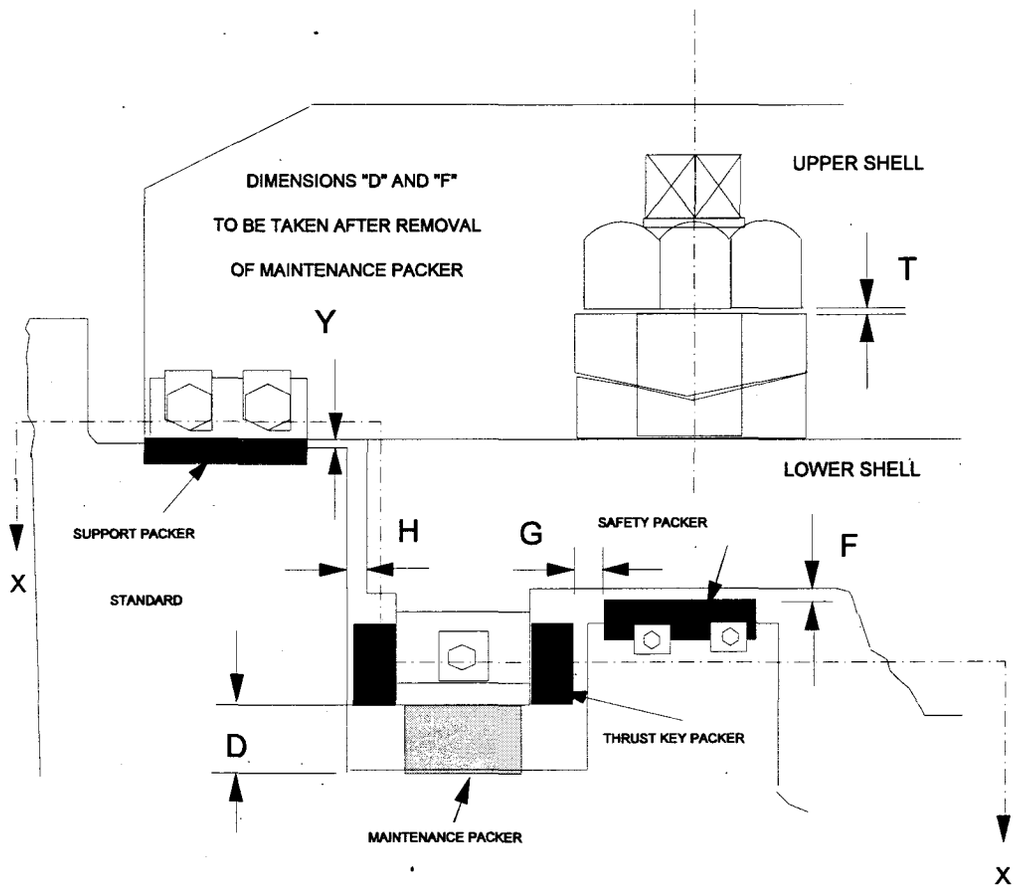
ALSTOM

RECORD SHEET **HP23/010 Sht 1 of 2** Page No. **2.17**

Title	**HP CYLINDER THRUST KEY & PAW GRIP CLEARANCES**						
Contract	**INTERMOUNTAIN**			Unit No	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by	Date	Supervisor		Date	Approved		Date



SECTION ON
'X - X'



SIDE VIEW ON TYPICAL FRONT-END THRUST KEY

ALSTOM

RECORD SHEET **HP23/010 Sht 2 of 2** Page No. **2.18**

Title **HP CYLINDER THRUST KEY & PAW GRIP CLEARANCES**

Contract **INTERMOUNTAIN** Unit No **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by W Gasser Date 4/3/03 Supervisor M Storey Date 4/3/03 Approved [signature] Date 5/3/03

TOP HALF CYL. REMOVED. (CYL ON BUILD PACKERS)

Readings in inches

THRUST KEY PACKER CLEARANCE - "A+B" (TOTAL)		DESIGN =
CYLINDER LHS	LH FRONT KEY	LH REAR KEY
	0.001	**0.002**
CYLINDER RHS	RH FRONT KEY	RH REAR KEY
	0.002	**0.001**

TOP PALM TO STANDARD CLEARANCE 'J' =		SAFETY PACKER CLEARANCE	O.E.M. DESIGN F = .060 ± .005
LH FRONT	N/A	LH FRONT	**0.061**
LH REAR	N/A	LH REAR	**0.025**
RH FRONT	N/A	RH FRONT	**0.067**
RH REAR	N/A	RH REAR	**0.036**

MAINTENANCE PACKER GAP - 'D'		PALM TO STANDARD GAP - 'Y'	
LH FRONT KEY	LH REAR KEY	LH FRONT KEY	LH REAR KEY
1.003	**1.028**	N/A	N/A
RH FRONT KEY	RH REAR KEY	RH FRONT KEY	RH REAR KEY
1.011	**1.041**	N/A	N/A

BOTTOM PALM TO STANDARD CLEARANCE - 'H'			
LH FRONT KEY	**0.575**	LH REAR KEY	**0.578**
RH FRONT KEY	**0.596**	RH REAR KEY	**0.557**

SAFETY PACKER TO THRUST KEY PACKER CLEARANCE - 'G'			
LH FRONT	**0.362**	LH REAR	**0.115**
RH FRONT	**0.018**	RH REAR	**0.226**
RETAINING BOLT CLEARANCE - 'T'			
LH FRONT	N/A	LH REAR	N/A
RH FRONT	N/A	RHY REAR	N/A

ALSTOM

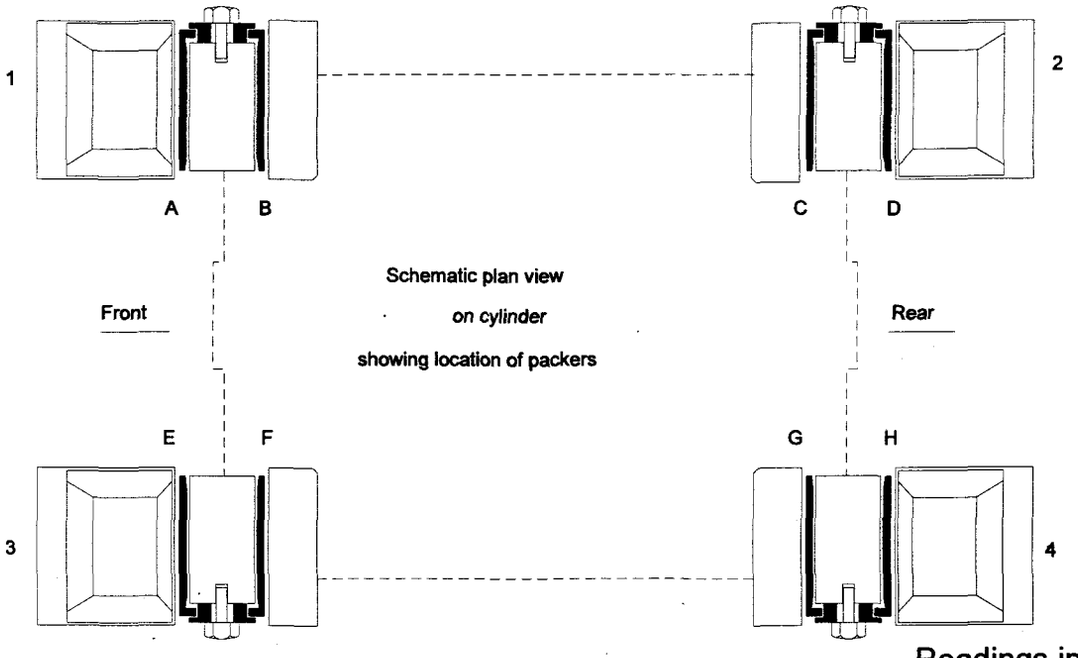
RECORD SHEET **HP23/005** Page No. **2.19**

Title **HP CYLINDER THRUST KEY & SUPPORT PACKER THICKNESSES**

Contract **INTERMOUNTAIN** Unit No **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by IPSC Date 5/3/03 Supervisor MLS/BG Date 5/3/03 Approved [signature] Date 6/3/03



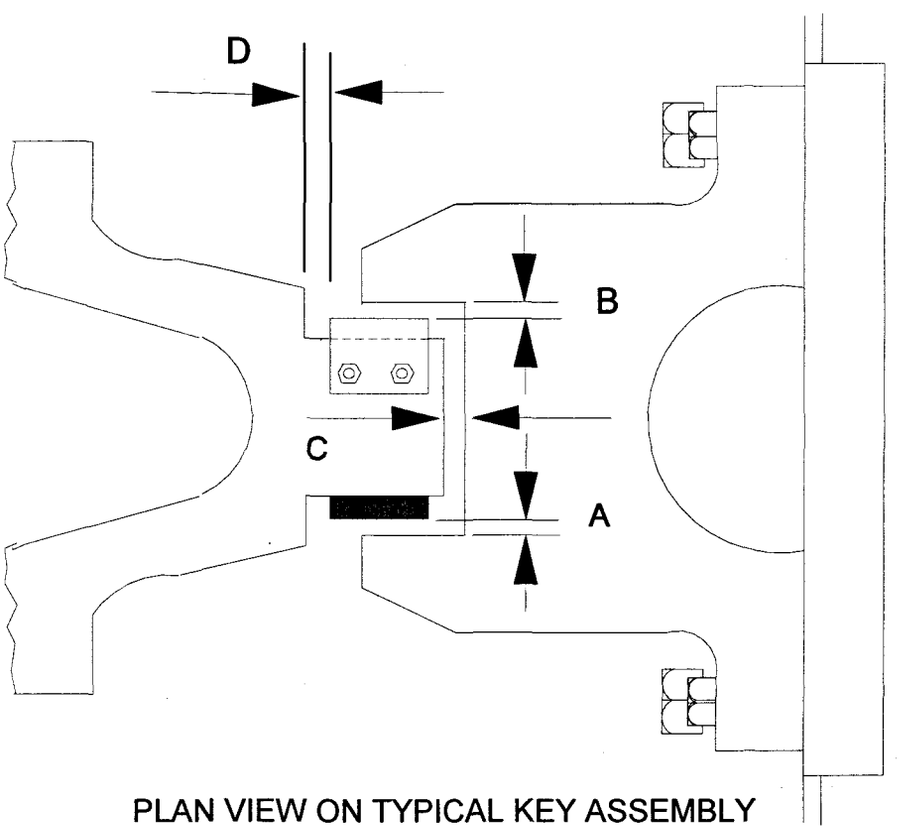
Readings in inches

THRUST KEY PACKER THICKNESSES	A	B	C	D
	0.739	**1.012**	**1.011**	**0.731**
	E	F	G	H
	0.762	**0.985**	**1.042**	**0.721**
CYLINDER PAW KEY WIDTH	LH FRONT	**5.252**	LH REAR	**5.244**
	RH FRONT	**5.250**	RH REAR	**5.240**
PEDESTAL KEYWAY WIDTH	LH FRONT	**3.500**	LH REAR	**3.500**
	RH FRONT	**3.501**	RH REAR	**3.486**
SUPPORTPACKER THICKNESS	LH FRONT	LH REAR	RH FRONT	RH REAR
	1.035	**1.062**	**1.032**	**1.066**
TEMPORARY SUPPORT PACKER THICKNESS	LH FRONT	**1.016**	LH REAR	**1.052**
	RH FRONT	**1.024**	RH REAR	**1.048**

ALSTOM

RECORD SHEET **HP21/003** Page No. **2.20**

Title	**HP CYLINDER TO PEDESTAL CENTRE LINE KEY CLEARANCES**						
Contract	**INTERMOUNTAIN**			Unit No	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by Randy	Date 5/3/03	Supervisor	B Grierson	Date 5/3/03	Approved		Date 7/3/03



PLAN VIEW ON TYPICAL KEY ASSEMBLY

Readings in inches

CYLINDER POSITION	KEY POSITION	(A +B)		C		D	
		DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
FRONT	TOP	--	N/A	--	N/A	--	N/A
	BOTTOM		0.007				
REAR	TOP		N/A		N/A		N/A
	BOTTOM		0.004				

ALSTOM

QC 001

CHECK SHEET ISSUE STATUS AND COMPLETION RECORD

CONTRACT **INTERMOUNTAIN** UNIT NO: **1** ST NO: **11246**

CHECKLIST NO: **1175**

SECTION NO: **6** TITLE: **HP CYLINDER - REBUILD** Sheet 1 of 2

PAGE NO	SHEET NO	DESCRIPTION	ISSUE	TS ENGR
6.1	HP20/001	HP Rotor bumping clearance and axial datums	A	
6.2	HP20/026	HP Inner cylinder to rotor axial datums - unboxed	A	
6.3	HP20/027	HP Inner & Outer cylinder/rotor radial datums - unboxed	A	
6.4	HP20/009	HP Inner cylinder/rotor radial datums - boxed	A	
6.5	HP20/018	HP/IP Rotor to casing vertical datums unboxed	A	
6.6	HP20/013	HP rotor to Front pedestal axial datum	A	
6.7	PD15/008	HP Rotor to Thrust pedestal axial datum	A	
6.8/6.9	HP11/036	HP Disc & diaphragm axial & radial clearances (2 Sheets)	A	
6.10	HP11/035	HP Rotor spill strip to shrouding clearances	A	
6.11	HP02/005	HP Shaft end gland clearances - box A Front	A	
6.12	HP02/005	HP Exhaust shaft gland clearances - box B Front	A	
6.13	HP02/005	HP Shaft cylinder gland clearances - box D Rear	A	
6.14	HP02/005	HP Shaft end gland clearances - box E Rear	A	
6.15	HP/CL2	HP Shaft gland box axial clearances - FRONT	A	
6.16	HP/CL1	HP Shaft gland box axial clearances - REAR	A	
6.17	HP05/007	HP Exhaust end gland 'B' carrier key clearances	A	
6.18	HP08/001	HP Gland box to cylinder half joint steps - boxes A, B, C & E	A	
6.19	HP24/028	HP Inner/Outer cyl half joint steps, axial & side datums	A	
6.20/6.22	PD09/002	HP Rotor radial bore readings	A	
6.23	HP02/011	HP Gland bore and joint gap checks - boxes A, B, D & E	A	
6.24	HP01/001	HP Shaft Gland Ring Butt Clearances	A	

IP7_006236

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QC 001

CHECK SHEET ISSUE STATUS AND COMPLETION RECORD

CONTRACT **INTERMOUNTAIN** UNIT NO: **1** ST NO: **11246**

CHECKLIST NO: **1175**

SECTION NO: **6** TITLE: **HP CYLINDER - REBUILD** Sheet 2 of 2

PAGE NO	SHEET NO	DESCRIPTION	ISSUE	TS ENGR
6.25	HP/CL3	HP Gland axial & radial mismatch - boxes A, D & E	A	
6.26	HP24/024	HP Outer cylinder joint gaps unbolted	A	
6.27	HP27/015	HP Steam inlet clearances	A	
6.28	HP27/019	HP Heater connection assembly	A	
6.29	HP27/020	HP Heater connection flange clearances	A	
6.30	HP27/019	HP leak off for IP rotor cooling connection assembly	A	
6.31-32	HP26/008	HP Inner to outer cylinder key clearances (2 Sheets)	A	
6.33	HP28/002	HP inner to outer cylinder baffle clearances	A	
6.34-35	HP23/010	HP Cylinder Thrust key and paw grip clearances (2 Shts)	A	
6.36	HP23/005	HP Cylinder Thrust key & support packer thicknesses	A	
6.37	HP21/003	HP Cylinder to pedestal centre line key clearances	A	
6.38	HP25/001	HP Cylinder component bolts - torque settings	A	
6.39-40	HP25/002	Controlled tightening of HP Inner cylinder bolts (2 Sheets)	A	
6.41-43	HP16/007	HP outer shell distortion correction factors - laser measurement	A	
6.44	HP18/001	HP Inner cylinder final box-up checks	A	
6.45	HP18/001	HP Outer cylinder final box-up checks	A	

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RECORD SHEET **HP20/001** Page No. **6.1**

Title **HP/IP ROTOR BUMPING CLEARANCE & AXIAL COLD DATUMS**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **21/3/02** Checked **BI** Check List No. **1175**

Taken by MLS/BG Date 19/3/03 Supervisor MLS/BG Date 19/3/03 Approved [signature] Date 21/3/03

Readings in inches

SHAFT IDENTIFICATION No.:	RF 113218

CYLINDER CONDITION	UNBOXED	BOXED (inner cyl +B gland only available)
DATUM WITH ROTOR HARD TO FRONT	9.808	9.660
ROTOR EXPANDING CLEARANCE (DESIGN .175)	0.152	0.300
DATUM WITH ROTOR HARD TO REAR	10.082	10.166
ROTOR CONTRACTING CLEARANCE (DESIGN .165)	0.122	0.206
TOTAL FLOAT (DESIGN .340)	0.274	0.506

Contacting:- Unboxed - To the REAR - Gland ring D4 To the FRONT - Gland ring E2
Boxed - inner cylinder Inlet gland 'C' expanding and contracting

EXTERNAL COLD DATUMS

FRONT-END THROWER TO GLAND	L.H.S.	N/A
	R.H.S.	N/A
REAR-END THROWER TO GLAND	L.H.S.	N/A
	R.H.S.	N/A

DISTANCE BETWEEN THE BACK FACE OF THE HP REAR COUPLING AND THE MIDDLE STANDARD, AT THE T2 BEARING HOUSING AXIAL LOCATION IN THE MIDDLE STANDARD	**9.960 *** (build working datum - see below for FINAL datum)
POSITION AT WHICH READING WAS TAKEN	LHS - just below half joint

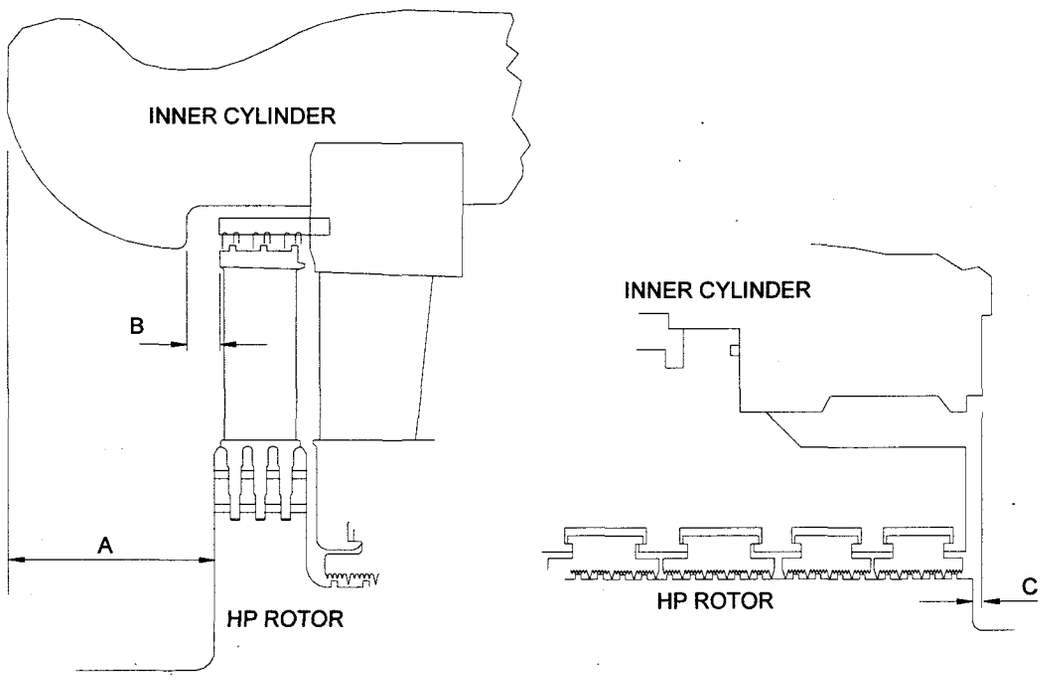
*** FINAL AXIAL DATUM AFTER ADJUSTMENT FOR THE IP FINAL POSITION = 10.086"** (24/3/2003)

ALSTOM

RECORD SHEET **HP20/026** Page No. **6.2**

Title **HP INNER CYLINDER TO ROTOR AXIAL DATUMS - UNBOXED**

Contract	**INTERMOUNTAIN**	Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**12/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by B Grierson	Date 9/3/03	Supervisor		Date	Approved	Date 10/3/03



Readings in inches

	FRONT **A**		FRONT **B**		REAR **C**	
	SHOP	SITE	SHOP	SITE	SHOP	SITE
LHS	---	No access at site	.507	.510	1.057	1.055
BOTT	---		---	N/R	---	N/R
RHS	---		.504	.506	1.055	1.051

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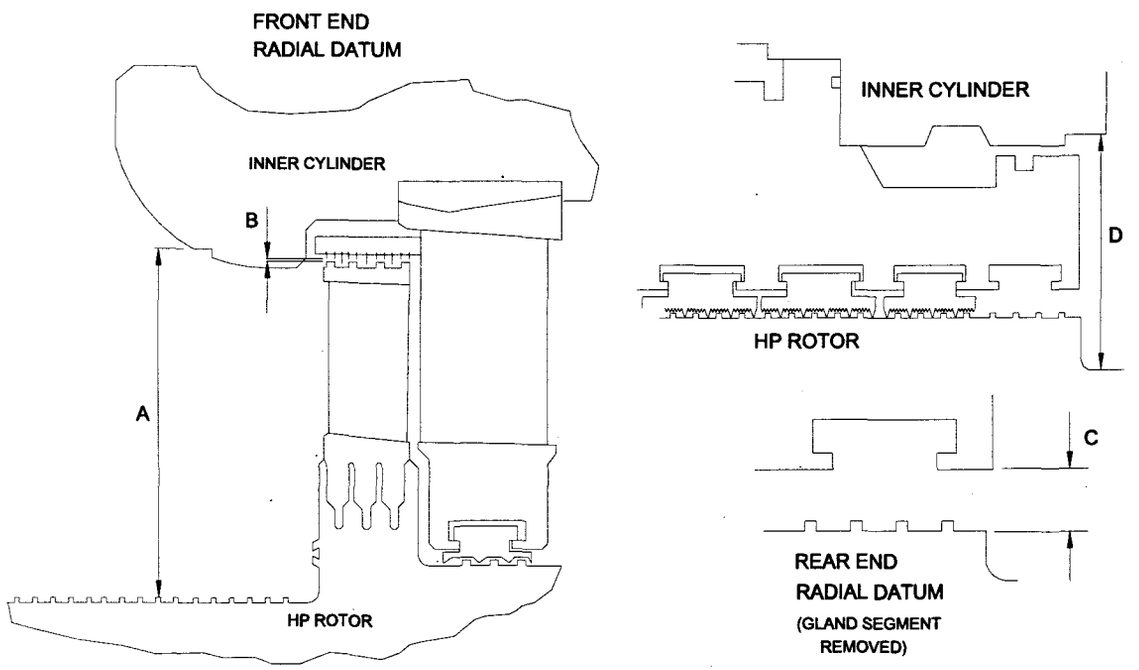
RECORD SHEET **HP20/027** Page No. **6.3**

Title	**HP INNER CYLINDER/ROTOR RADIAL DATUMS - UNBOXED**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**12/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by B Grierson	Date 9/3/03	Supervisor		Date		Approved	Date 16/3/03



Readings in inches

	FRONT A		FRONT B		REAR C		REAR D	
	SHOP	SITE	SHOP	SITE	SHOP	SITE	SHOP	SITE
LHS	---	No access at site	0.034	0.036	.707	.705	6.003	6.001
BOTT	---		0.028	No access	.700	No access	No access	No access
RHS	---		0.034	0.032	.705	.708	6.002	6.004

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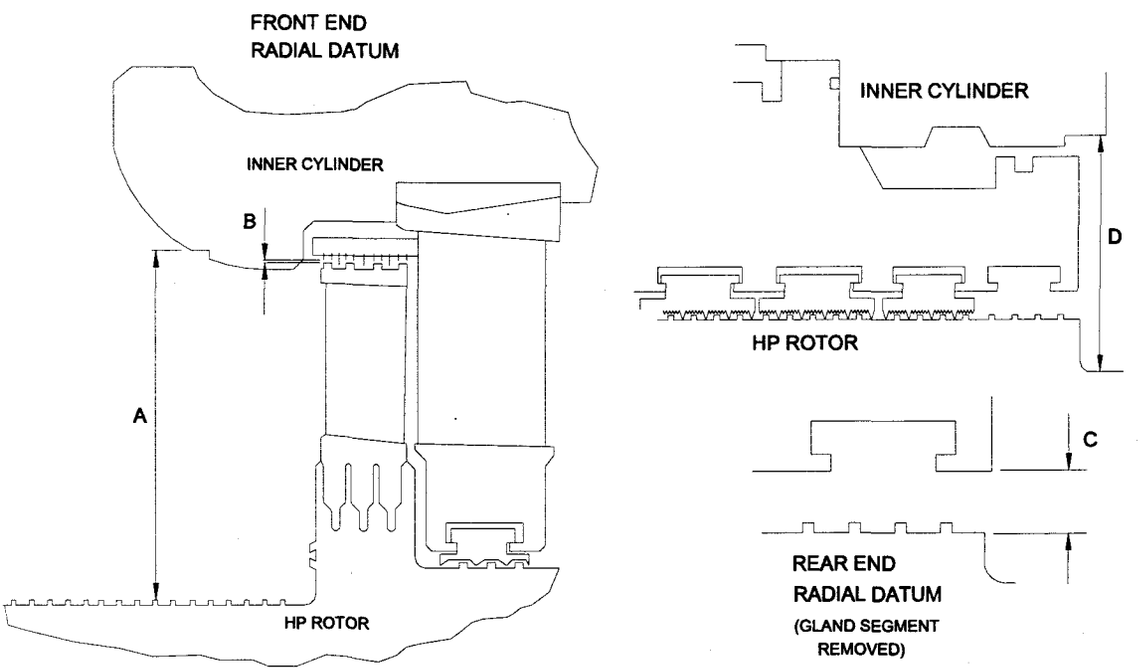
RECORD SHEET **HP20/009** Page No. **6.4**

Title **HP INNER CYLINDER/ROTOR RADIAL DATUMS - BOXED**

Contract	**INTERMOUNTAIN**	Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**12/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by B Grierson	Date 20/3/03	Supervisor		Date	Approved	Date 21/3/03



Readings in inches

	FRONT A		FRONT B		REAR C		REAR D	
	SHOP	SITE	SHOP	SITE	SHOP	SITE	SHOP	SITE
LHS (BOTT)	---	No access	---	No access	---	Not applicable	6.003	6.001
BOTT	---		---		---		---	No access
RHS (BOTT)	---		---		---		6.002	6.004
TOP	---		---		---		6.012	6.006

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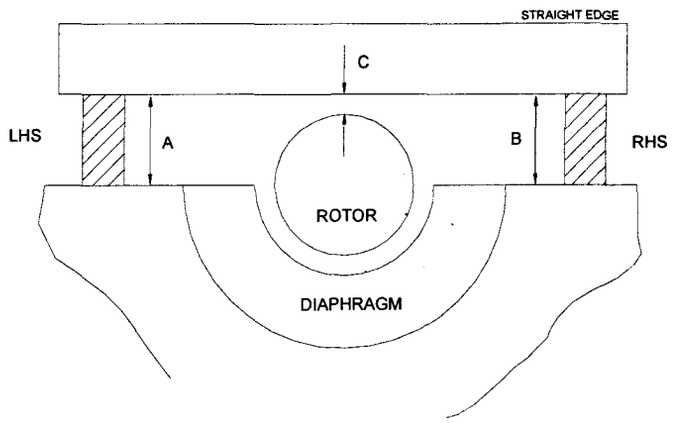
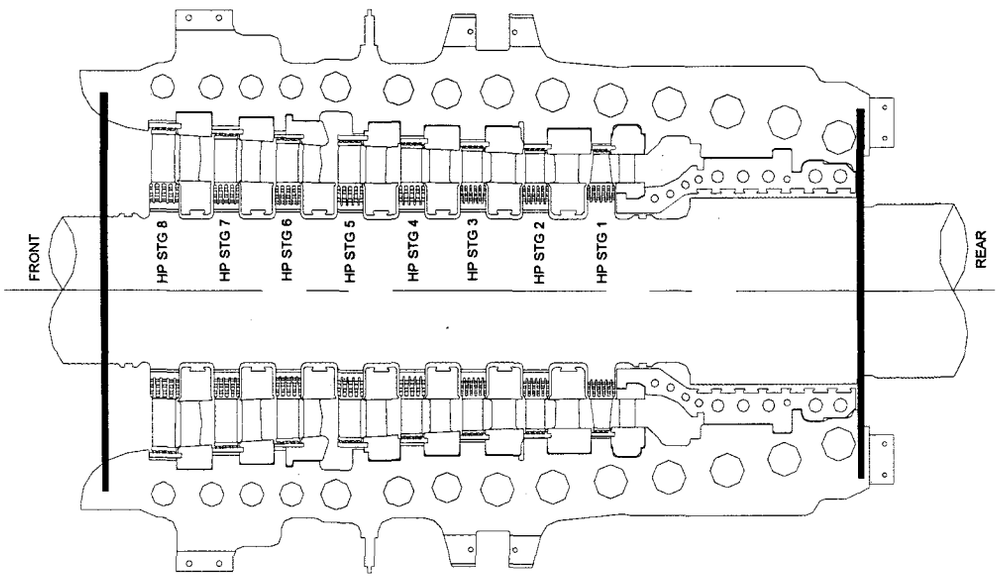
RECORD SHEET **HP20/018** Page No. **6.5**

Title	**HP/IP ROTOR TO CASING VERTICAL DATUMS - UNBOXED**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**12/02/02**	Checked	**BI**	Check List No.	**1175**
Taken IPSC	Date 19/3/03	Supervisor M Storey		Date 19/3/03	Approved		Date 21/3/03





Note: Vertical datum measurement taken with rotor / gland bottom build clearances established and without any compensation for bolt up. Readings are with the outer cylinder on Build keys

POSITION	A	B	C	*Works build adjusted	Difference Site/Works	Tops off/ Tops on Change
HP DIAPHRAGM St. 8	13.812	13.8115	1.9545	2.068	2.069	-0.008
HP INLET GLAND	14.813	14.8135	1.326	1.335	1.326	+ 0.005

* Works build figures adjusted for difference in straight edge support block dimensions.
Vertical error corrected by later adjustment on running keys

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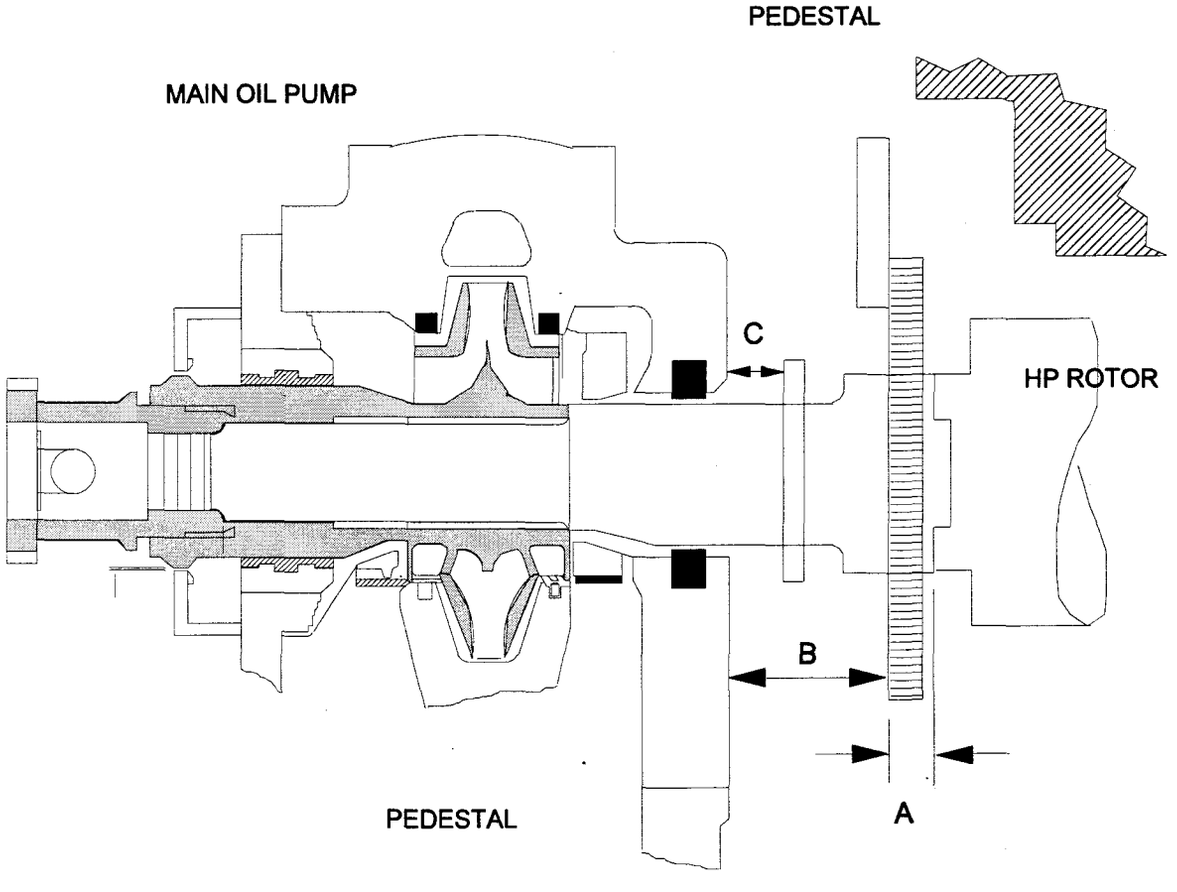
RECORD SHEET **HP20/013** Page No. **6.6**

Title	**ROTOR TO FRONT PEDESTAL AXIAL DATUM**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by W Falconer	Date 26/3/03	Supervisor		Date		Approved	Date 26/3/03

NEW HP ROTOR



ROTOR IN COLD SET POSITION PUSHED TO **FRONT** Readings in inches

DATUM		POSITION
A	N/A	
B	8.111	Pump casing to Wheel - LHS just below half joint
C	1.138	Pump casing to collar - LHS just below half joint

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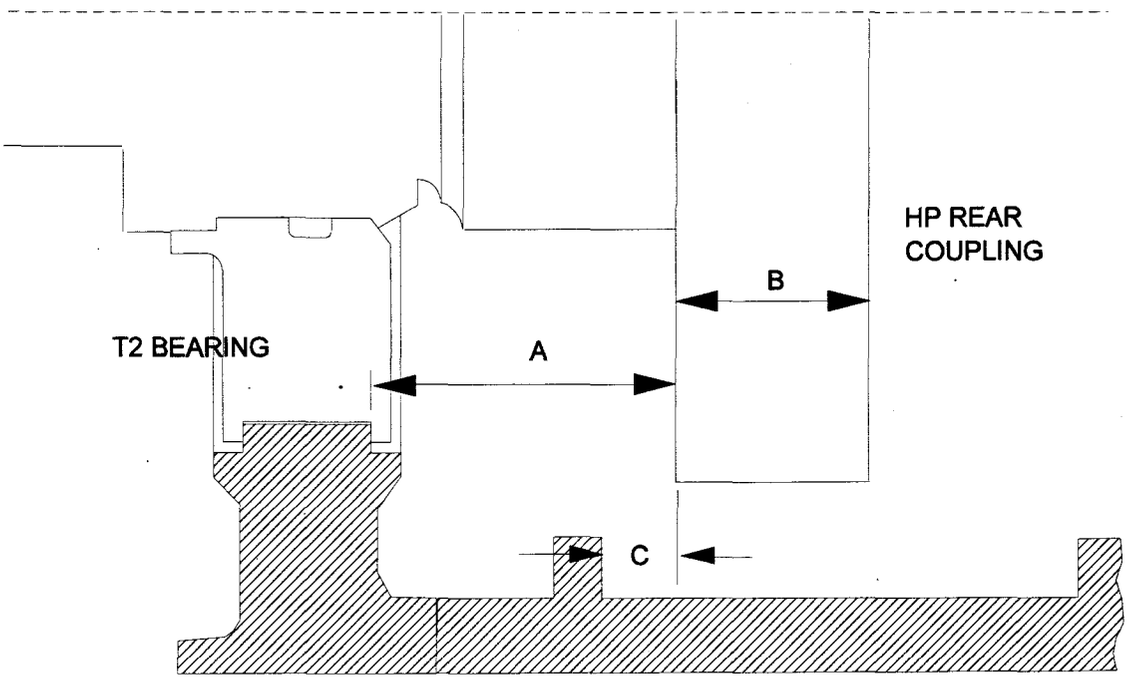
RECORD SHEET **PD15/008** Page No. **6.7**

Title	**HP ROTOR TO THRUST PEDESTAL AXIAL DATUM**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by iPSC	Date 26/3/03	Supervisor		Date	Approved	Date 26/3/03	

HP ROTOR AXIAL DATUM
IN THRUST PEDESTAL



ROTORS IN COLD SET POSITION PUSHED TO THE **FRONT** Readings in inches

DATUM	NEW ROTOR	POSITION
A	Working datum 9.960 **FINAL** datum 10.086	LHS
B	N/R	N/A
C	N/R	

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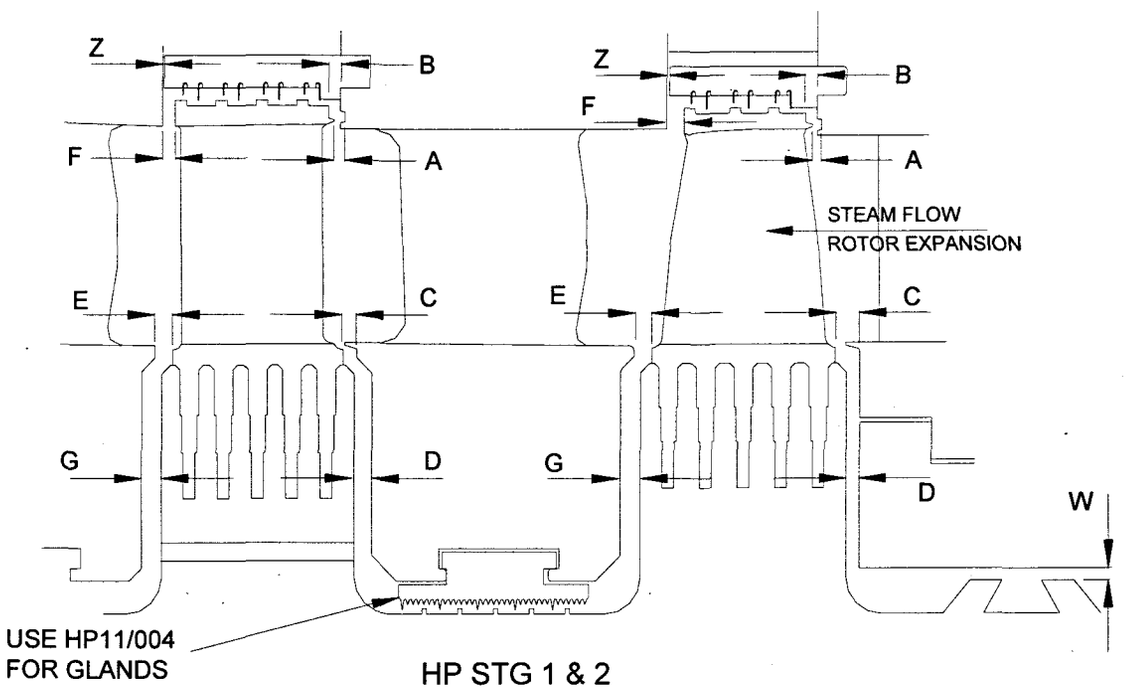
RECORD SHEET	**HP11/036 Sht 1**	**of 2**				Page No.	**6.8**
Title	**HP DIAPHRAGM & WHEEL CLEARANCES**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by	Date	Supervisor	Date	Approved		Date	

REF DRAWING : R277/1338 REV B



HP STG 1 & 2
TYPICAL FOR STAGES 3 TO 8

ALL AXIAL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.
MINIMUM CLEARANCE TO BE RECORDED.

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RECORD SHEET **HP11/036 Sht 2 of 2** Page No. **6.9**

Title **H.P. DIAPHRAGM & WHEEL CLEARANCES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by As works build Date Supervisor Date Approved Date 21/3/03

REF DRAWING: R277/1338 REV B

ROTOR AXIAL DATUM = **9.960**
(HP Coupling to T2 Bearing)

(F= Front End, R= Rear End)

Readings in inches

BLADING STAGE			8	7	6	5	4	3	2	1
A	DESIGN		.224				.221	.213	.197	.185
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8							
		RHS								
B	DESIGN		.264				.260	.252	.236	.224
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8							
		RHS								
C	DESIGN		.268		.287	.299	.295	.287	.283	.213
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8							
		RHS								
D	DESIGN		.343		.366	.378	.382	.374		.276
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8							
		RHS								
E	DESIGN		.634	.496	.484	.472	.453	.429	.406	
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8							
		RHS								
F	DESIGN		.500	.496	.484	----	.453	.429	.406	
	ACTUAL	LHS		SEE WORKS BUILD SECTION 5 PAGE 8						
		RHS								
G	DESIGN		.823	.547		.524	.504	.480	.457	
	ACTUAL	LHS		SEE WORKS BUILD SECTION 5 PAGE 8						
		RHS								
Z	DESIGN		.039			1.496	.039			
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8							
		RHS								
W	DESIGN		'B' GLAND DESIGN = .427				'C' GLAND DESIGN = .315			
	ACTUAL	LHS	Not measured				SEE SECTION 5.8			
		RHS	"				"			

ALSTOM

RECORD SHEET **HP11/035** Page No. **6.10**

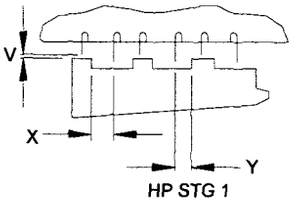
Title **HP ROTOR SPILL STRIP TO SHROUDING CLEARANCES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

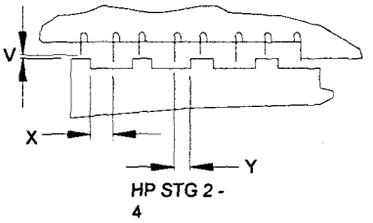
Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by As works build Date Supervisor Date Approved Date 21/3/03

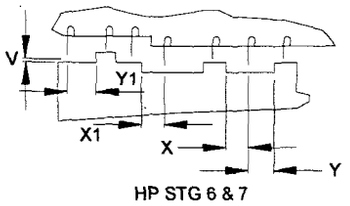
REF DRAWING:
R277/1338 REV B



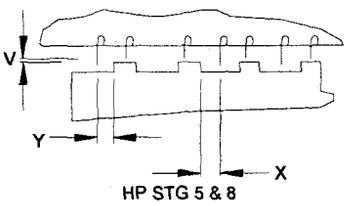
HP STG 1



HP STG 2 - 4



HP STG 6 & 7



HP STG 5 & 8

BLADING STAGE			8	7	6	5	4	3	2	1
V	TOP	DES	.031	.030	.028	.028	.028	.028	.043	.028
		ACT	See Section 5 Page 9							
	BOT	DES	.031	.030	.028	.028	.028	.028	.043	.028
		ACT	See Section 5 Page 9							
	DESIGN		.031	.030	.028	.028	.028	.028	.043	.028
	LHS	ACT	See Section 5 Page 9							
	RHS	ACT	"							
X	DESIGN		.244	.315	.354	.240	.240	.240	.220	.228
	ACTUAL	LHS	See Section 5 Page 9							
		RHS	"							
X1	DESIGN		----	.276	.236	----	----	----	----	----
	ACTUAL	LHS	----	See Section 5 Page 9		----	----	----	----	----
		RHS	----			----	----	----	----	----
Y	DESIGN		.476	.563	.610	.429	.421	.421	.385	.441
	ACTUAL	LHS	See Section 5 Page 9							
		RHS	"							
Y1	DESIGN		----	.488	.437	----	----	----	----	----
	ACTUAL	LHS	----	See Section 5 Page 9		----	----	----	----	----
		RHS	----	"		----	----	----	----	----

ALSTOM

RECORD SHEET **HP02/005** Page No. **6.11**

Title **HP SHAFT END GLAND CLEARANCES - BOX A FRONT**

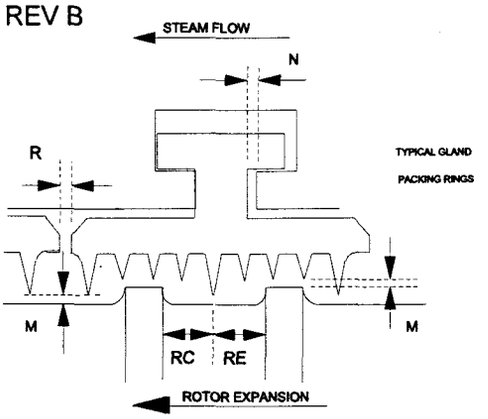
Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by BG/MLS Date March 03 Supervisor BG/ MLS Date Mar 03 Approved [signature] Date 21/3/03

REF DRAWING :- R277/1338 REV B

ROTOR AXIAL DATUM = **9.960**
(HP Coupling to T2 Bearing)



ALL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM. (F= Front End, R= Rear End)
RC REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM. Readings in inches

GLAND RING NO.			A1 F	A2 R
RE (L)	DESIGN		.550	.550
	LHS		0.595	0.564
	RHS		0.595	0.564
RC (O)	DESIGN		.290	.290
	LHS		0.264	0.280
	RHS		0.248	0.280
M	TOP	DES	.025	.025
		ACT	.038*	.037*
	BOT	DES	.025	.025
		ACT	.032**	.032**
	LHS	DES	.025	.025
		ACT	.020	.021
	RHS	DES	.025	.025
		ACT	.024	.029
N	DESIGN		---	---
	LHS			
	RHS			
R	DESIGN		---	---
	LHS			
	RHS			

* From top lead (uncorrected) ** From tape-on-rotor check (uncorrected)

ALSTOM

RECORD SHEET **HP02/005** Page No. **6.12**

Title **HP EXHAUST SHAFT GLAND CLEARANCES - BOX B FRONT**

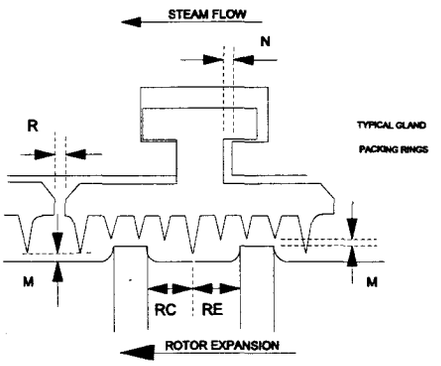
Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by BG/MLS Date March 03 Supervisor BG/MLS DateMar 03 Approved [signature] Date 21/3/03

REF DRAWING :- R277/1338 REV B

ROTOR AXIAL DATUM = **9.960**
(HP Coupling to T2 Bearing)



ALL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM.
RC REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

(F= Front End, R= Rear End)
Readings in inches

GLAND RING NO.			B1	B2	B3	B4	B5
RE (L)	DESIGN		.550	.550	.550	.550	.550
	LHS		0.564	0.564	0.579	0.579	0.579
	RHS		0.579	0.564	0.579	0.579	0.579
RC (O)	DESIGN		.290	.290	.290	.290	.290
	LHS		0.280	0.280	0.249	0.249	0.249
	RHS		0.280	0.264	0.249	0.249	0.249
M Readings are Long fin/short fin	TOP	DES	.020	.020	.020	.020	.020
		ACT	.022*	.023*	.023*	.024*	.023*
	BOT	DES	.020	.020	.020	.020	.020
		ACT	.018	.017	.016	.016	.017
	LHS	DES	.020	.020	.020	.020	.020
		ACT	.016/.016	.015/.015	.015/.014	.012/.011	.011/.011
	RHS	DES	.020	.020	.020	.020	.020
		ACT	.019/.019	.0.021/.021	.023/.022	.021/.020	.020/.019
N	DESIGN		---	---	---	---	---
	RHS						
R	DESIGN		---	---	---	---	---
	LHS						
	RHS						

* Top lead minus nominal TO/TO shift allowance

ALSTOM

RECORD SHEET **HP02/005** Page No. **6.13**

Title **HP SHAFT CYLINDER GLAND CLEARANCES - BOX D REAR**

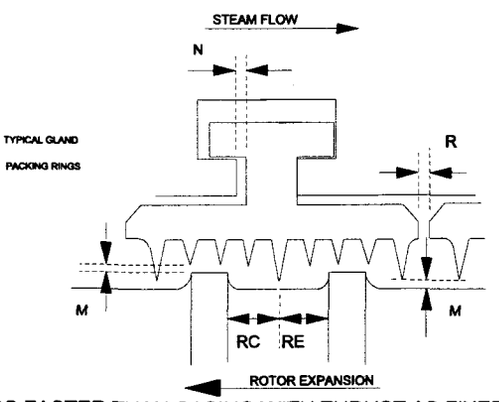
Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by MLS/BG Date March 03 Supervisor MLS/ BG Date Mar 03 Approved [signature] Date 21/3/03

REF DRAWING :- R277/1338 REV B

ROTOR AXIAL DATUM = **9.960**
(HP Coupling to T2 Bearing)



ALL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM.
RC REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

(F= Front End, R= Rear End)
Readings in inches

GLAND RING NO.			D1	D2	D3	D4
RE (L)	DESIGN		.180	.180	.180	.180
	LHS		.165	.180	.165	.195
	RHS		.170	.193	.180	.182
RC (O)	DESIGN		.170	.170	.170	.170
	LHS		.135	.129	.135	.120
	RHS		.142	.130	.143	.135
M	TOP	DES	.020	.020	.020	.020
		ACT	-	-	-	-
	BOT	DES	.020	.020	.020	.020
		ACT	.025	.030	.025	.025
	LHS	DES	.020	.020	.020	.020
		ACT	.020/.020	.019/.019	.020/.020	.016/.016
	RHS	DES	.020	.020	.020	.020
		ACT	.018/.019	.017/.017	.020/.018	.023/.023
N	DESIGN		---	---	---	---
	LHS					
	RHS					
R	DESIGN		---	---	---	---
	LHS					
	RHS					

ALSTOM

RECORD SHEET **HP02/005** Page No. **6.14**

Title **HP SHAFT END GLAND CLEARANCES - BOX E REAR**

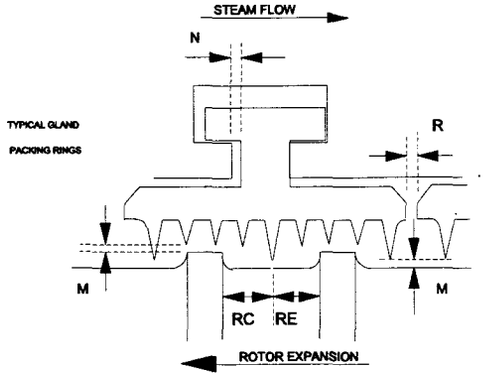
Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by MLS/BG Date March 03 Supervisor MLS/BG Date Mar 03 Approved [signature] Date 21/3/03

REF DRAWING :- R277/1338 REV B

ROTOR AXIAL DATUM = **9.960**
(HP Coupling to T2 Bearing)



ALL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM.
RC REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

(F= Front End, R= Rear End)
Readings in inches

GLAND RING NO.			E1	E2
RE (L)	DESIGN		.175	.175
	LHS		.157	.157
	RHS		.157	.157
RC (O)	DESIGN		.165	.165
	LHS		.186	.186
	RHS		.186	.186
M	TOP	DES	.025	.025
		ACT	.047*	.044*
	BOT	DES	.025	.025
		ACT	.020**	.020**
	LHS	DES	.025	.025
		ACT	.025	.025
	RHS	DES	.025	.025
		ACT	.023	.025
N	DESIGN		----	----
	LHS			
	RHS			
R	DESIGN		----	----
	LHS			
	RHS			

* Top lead (corrected for TO/TO shift) ** From tape-on-rotor checks (corrected for TO/TO shift)

ALSTOM

RECORD SHEET **HP/CL2** Page No. **6.15**

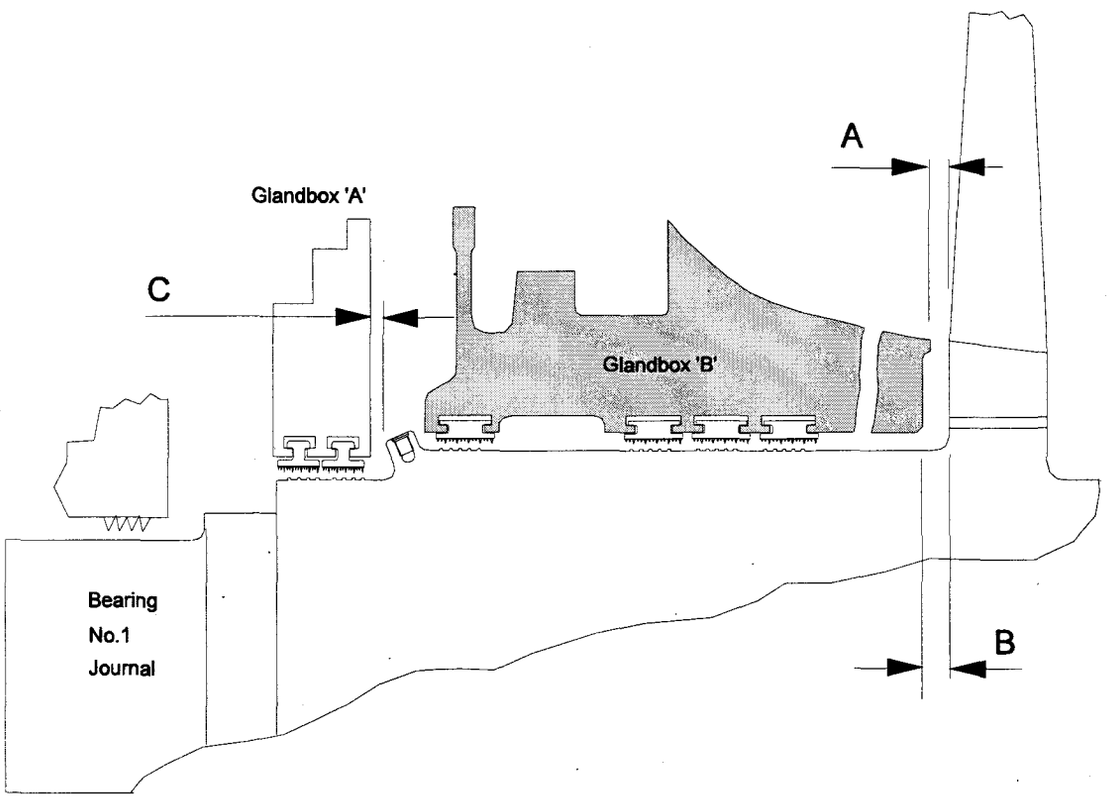
Title **HP SHAFT GLAND BOX AXIAL CLEARANCES - FRONT**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by B Grierson Date 20/3/03 Supervisor Date Approved [signature] Date 21/3/03

REF DRAWING :- R217/A0/1338 Rev. B



ROTOR AXIAL DATUM = **9.960**
(HP Coupling to T2 Bearing)

ROTOR IN THE COLD SET POSITION PUSHED TO **FRONT**

Readings in inches

POSITION	A (RE)	B (RE)	C (RE)	
DESIGN	.634	.823	.820	
LHS	.612	Not recorded	.782	
RHS	.607	Not recorded	.783	

RE = ROTOR EXPANDING CLEARANCE **RC** = ROTOR CONTRACTING CLEARANCE

ALSTOM

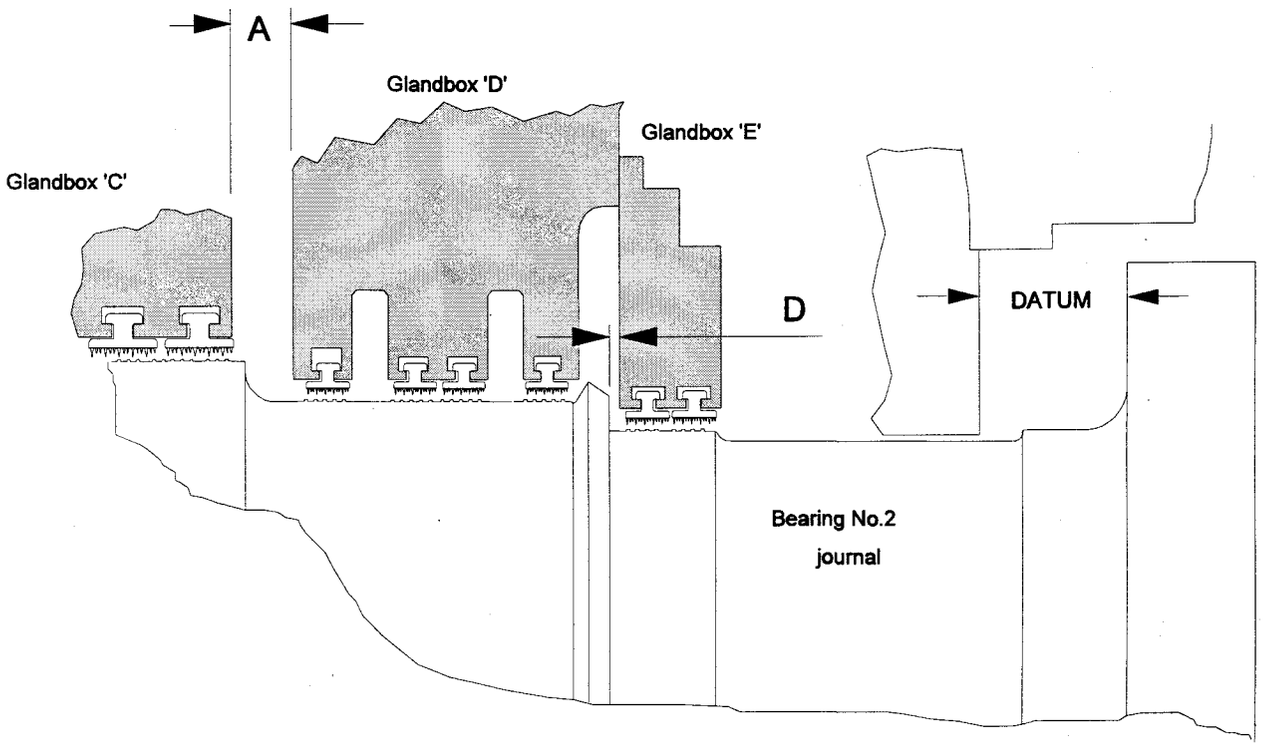
RECORD SHEET **HP/CL1** Page No. **6.16**

Title **HP SHAFT GLAND BOX AXIAL CLEARANCES - REAR**

Contract	**INTERMOUNTAIN**	Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**

Taken by B Grierson Date 20/3/03 Supervisor BG Date 20/3/03 Approved [signature] Date 21/3/03

REF DRAWING :- R217/A0/1338 Rev. B



ROTOR AXIAL DATUM = **9.960**
(HP Coupling to T2 Bearing)

ROTOR IN THE COLD SET POSITION PUSHED TO **FRONT**

Readings in inches

POSITION	A	B (RC)	C (RE)	D (RC)
DESIGN		N/A	N/A	1.054
LHS	3.250	---	---	1.091
RHS	3.250	---	---	1.097

RE = ROTOR EXPANDING CLEARANCE **RC** = ROTOR CONTRACTING CLEARANCE

ALSTOM

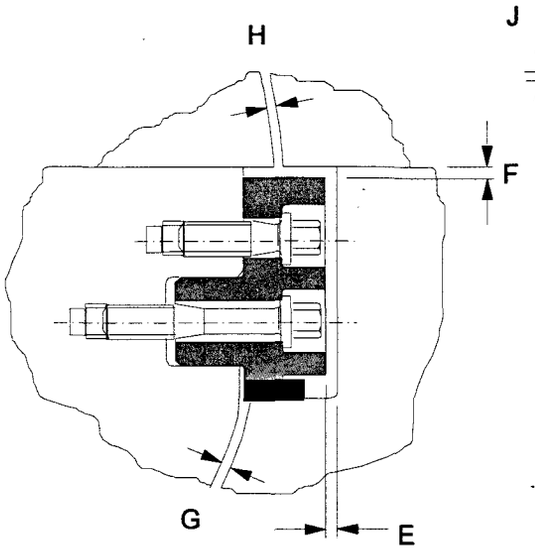
RECORD SHEET **HP05/007** Page No. **6.17**

Title **HP EXHAUST END GLAND 'B' CARRIER KEY CLEARANCES**

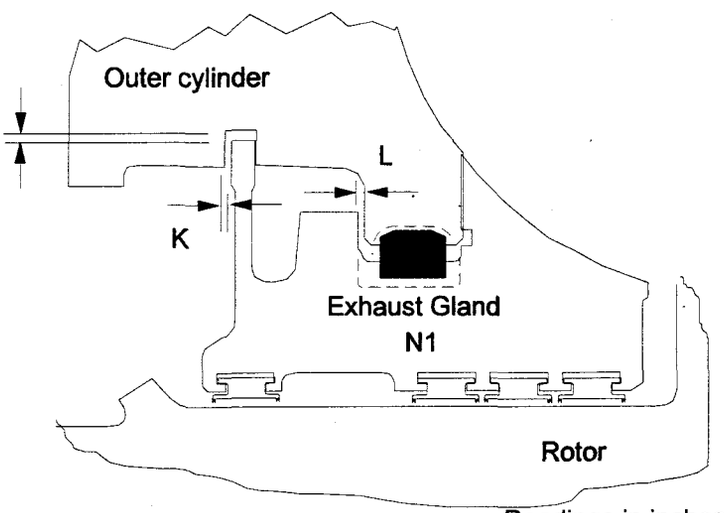
Contract	INTERMOUNTAIN	Unit No.	1	Serial No.	11246
Site Issue	A	Date	17/02/02	Checked	BI	Check List No.	1175

Taken by B Grierson Date 18/3/03 Supervisor BG Date 18/3/03 Approved [signature] Date 19/3/03

REF DRWNG :-

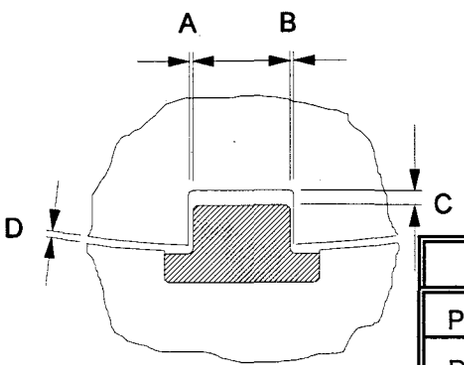


Side support key



Readings in inches

SIDE SUPPORT KEYS				
POSITION	E	F	G	H
DESIGN	---	---	---	---
LHS	.145	-.003	.127	NR
RHS	.062	-.003	.118	NR



Bottom
Centralising key

BOTTOM CENTRALISING KEY			
POSITION	A + B	C	D
DESIGN	---	---	---
BOTTOM	.002	NR	NR

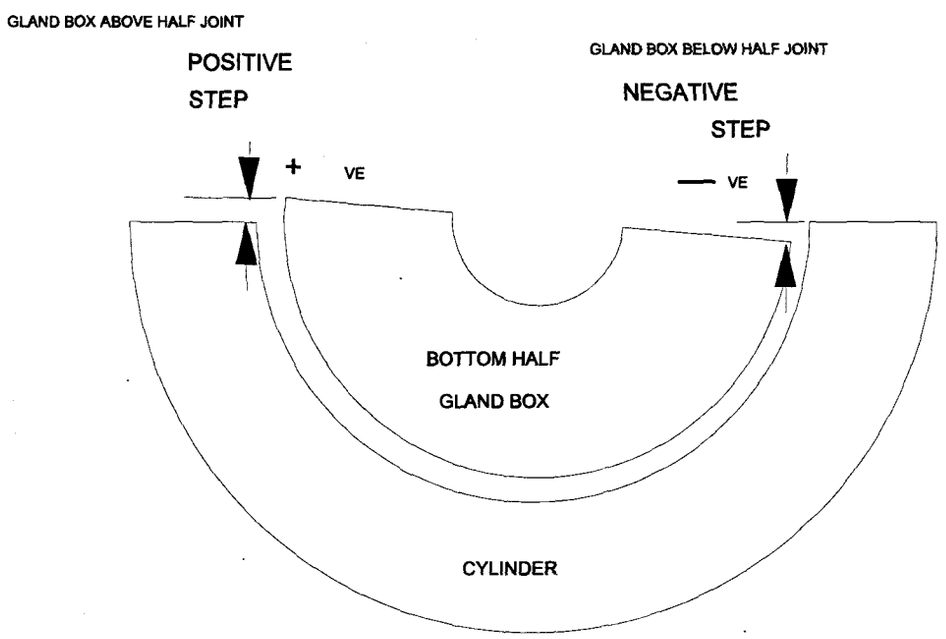
AXIAL LOCATION CLEARANCES						
POS	J		K		L	
DES	---		---		---	
	*	*	LHT	*	LH Top	*
LHS	*	*	RHT	*	RH Top	*
C/L	*	*	LHB	*	LH Bot	*
RHS	*	*	RHB	*	RH Bot	*

* Original packing head - no change

ALSTOM

RECORD SHEET **HP08/001** Page No. **6.18**

Title	**HP GLAND BOX TO OUTER CYLINDER HALF JOINT STEPS**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by IPSC	Date March 03	Supervisor	BG/MLS	Date		Approved	Date 20/3/03



POSITION AT WHICH READINGS ARE TAKEN TO BE MARKED 'X'

Readings in inches

	BOLT ON GLAND BOX A FRONT CORNER	BOLT ON GLAND BOX A REAR CORNER	EXHAUST GLAND BOX B FRONT CORNER	EXHAUST GLAND BOX B REAR CORNER	BOLT ON GLAND BOX E FRONT CORNER	BOLT ON GLAND BOX E REAR CORNER
LHS	-0.010	N/A	+0.003	-0.001	N/A	+0.028
RHS	+0.005	N/A	+0.001	-0.000	N/A	-0.024

NOTE + SIGN TO INDICATE BUSH PROUD OF CYLINDER HALF JOINT
- SIGN TO INDICATE BUSH BELOW CYLINDER HALF JOINT.

ALSTOM

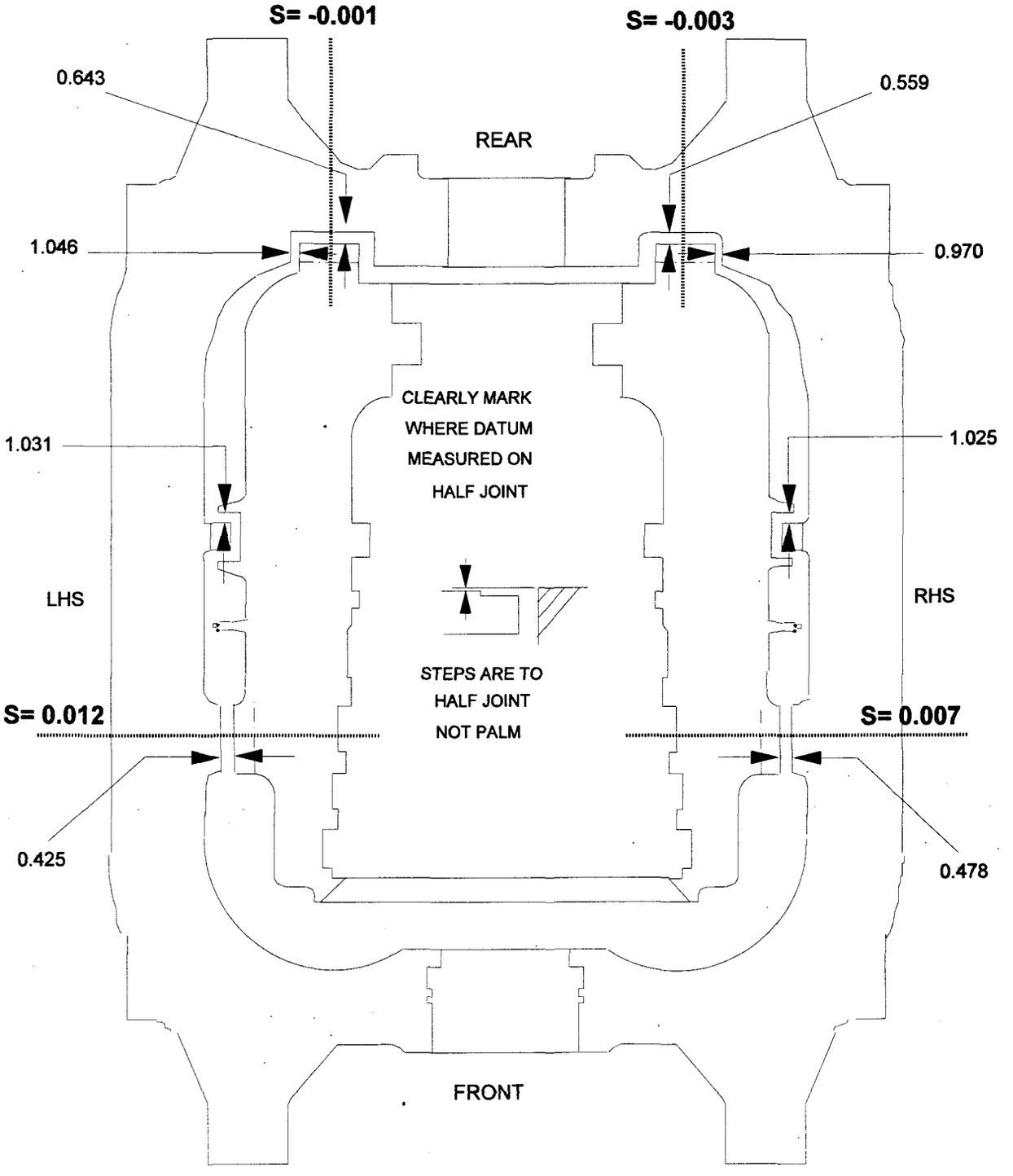
RECORD SHEET **HP24/028** Page No. **6.19**

Title	**HP INNER/OUTER CYL HALF JOINT STEPS, AXIAL & SIDE DATUMS**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**

Taken by IPSC Date 9/3/03 Supervisor M Storey Date 9/3/03 Approved [signature] Date 9/3/03

Readings X 0.001"

ROTOR / T2 AXIAL DATUM 9.952" (Note Final axial datum selected = 9.960")



\+ = INNER HIGHER THAN OUTER

— = INNER LOWER THAN OUTER

S = HALF JOINT STEP

ALSTOM

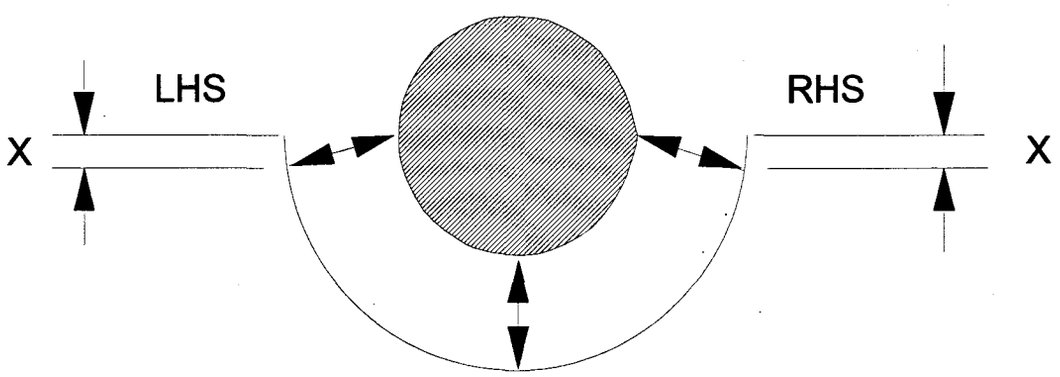
RECORD SHEET **PD09/002** Page No. **6.20**

Title **HP ROTOR POSIT. RADIAL CHKS - ON BUILDING KEYS UNBOXED**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **12/02/02** Checked **BI** Check List No. **1175**

Taken by IPSC Date 17/3/03 Supervisor MLS Date17-21Mar Approved Wtg Galloway Date 23/3/03



BRIDGE GAUGE

T1 (8.002) **BG 1.511** (8.004)

T2 (8.001) **BG 0.464** (8.003)

Bridge leg heights from standard half joint in brackets

DIMENSION X = FOR ALL SIDE DATUMS

Type Stamp Identification Letter on the Half Joints, in line with, and close to, the bore being measured from.

Readings in inches

DATUM POSITION		UNBOXED DATUMS- ON BUILD KEYS - Rotor centred in brgs			COMMENTS
		LHS	BOT/TOP	RHS	
T1 PEDESTAL BORE		7.657	6.539	7.642	
FRONT BOLT-0N GLAND- SEGMENT REMOVED		0.878	0.874	0.883	
CYLINDER BORE - FRONT	TOP HALF	N/A	N/A	N/A	
	BOTT HALF		----		
CYLINDER BORE - REAR	TOP HALF	N/A	N/A	N/A	
	BOTT HALF		----		
REAR BOLT-0N GLAND- SEGMENT REMOVED		0.8715	0.892	0.874	
T2 PEDESTAL BORE		10.003	10.046	10.004	

ALSTOM

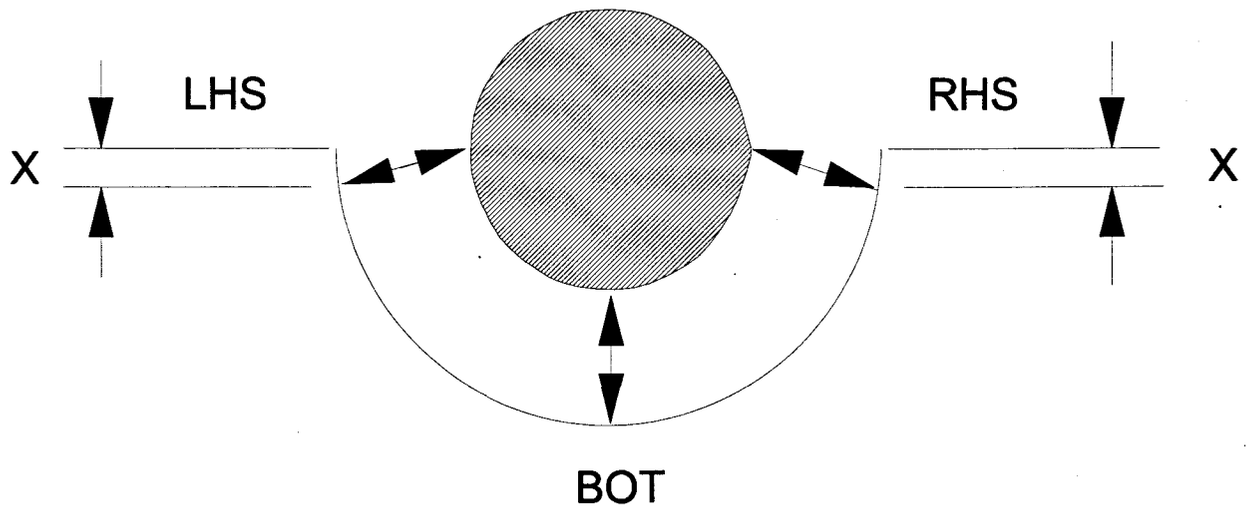
RECORD SHEET **PD09/002** Page No. **6.21**

Title **HP ROTOR POSITION RADIAL- ON BUILDING KEYS BOXED**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **12/02/02** Checked **BI** Check List No. **1175**

Taken by B Grierson Date 23/3/03 Supervisor Date Approved W Date 23/3/03



DIMENSION X = FOR ALL SIDE DATUMS

Type Stamp Identification Letter on the Half Joints, in line with, and close to, the bore being measured from.

Readings in inches

DATUM POSITION		BOXED DATUMS- ON BUILD KEYS			COMMENTS
		LHS	BOT/TOP	RHS	
T1 PEDESTAL BORE		N/A	N/A	N/A	
FRONT BOLT-0N GLAND- SEGMENT REMOVED		0.881	N/R	0.885	
CYLINDER BORE - FRONT	TOP HALF	---	9.658	---	
	BOTT HALF	---	N/A	---	
CYLINDER BORE - REAR	TOP HALF	---	8.170	---	
	BOTT HALF	---	N/A	---	
REAR BOLT-0N GLAND- SEGMENT REMOVED		0.875	N/R	0.882	
T1 PEDESTAL BORE		N/A	N/A	N/A	

Rotor centred in bearings

ALSTOM

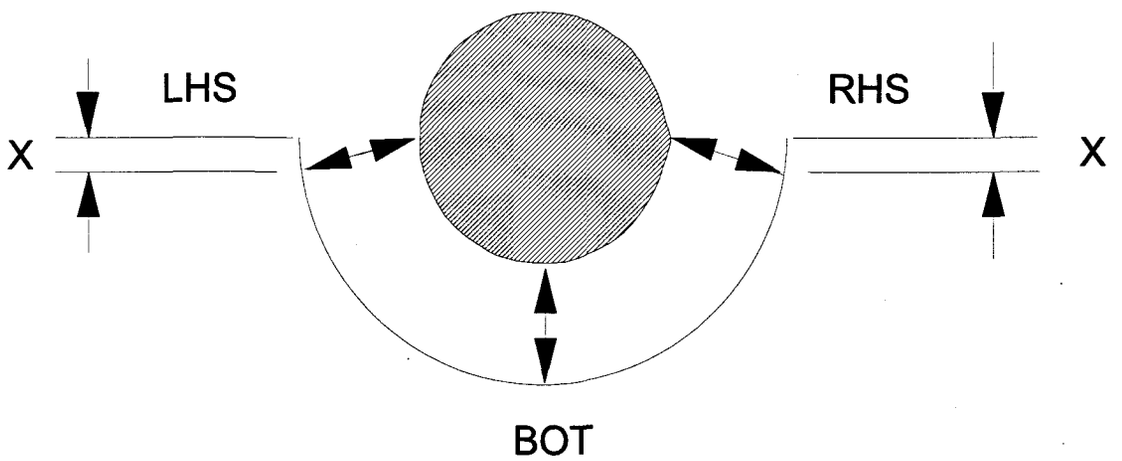
RECORD SHEET **PD09/002** Page No. **6.22**

Title **HP ROTOR POSITION RADIAL- ON RUNNING KEYS BOXED**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **12/02/02** Checked **BI** Check List No. **1175**

Taken by W Falconer Supervisor Date 26/3/03 Approved W Falconer Date 26/3/03



DIMENSION X = FOR ALL SIDE DATUMS

Type Stamp Identification Letter on the Half Joints, in line with, and close to, the bore being measured from.

Readings in inches

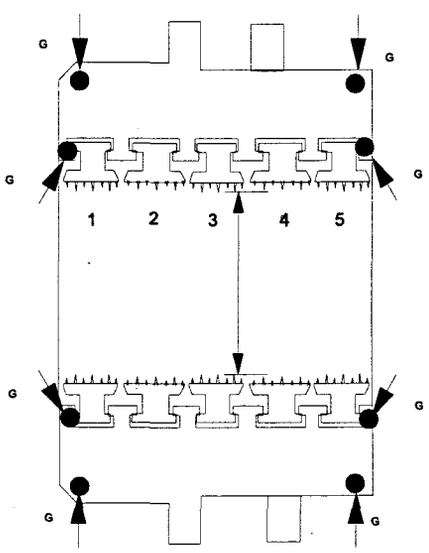
DATUM POSITION		BOXED DATUMS- ON RUNNING KEYS			COMMENTS
		LHS	BOT/TOP	RHS	
T1 PEDESTAL BORE		N/A	N/A	N/A	
FRONT BOLT-0N GLAND- SEGMENT REMOVED		0.881	-	0.883	
CYLINDER BORE - FRONT	TOP HALF	-	9.6595	-	
	BOTT HALF	-	N/A	-	
CYLINDER BORE - REAR	TOP HALF	-	8.168	-	
	BOTT HALF	-	N/A	-	
REAR BOLT-0N GLAND- SEGMENT REMOVED		0.881	-	0.876	
T1 PEDESTAL BORE		N/A	N/A	N/A	

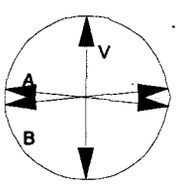
ALSTOM

RECORD SHEET **HP02/011** Page No. **6.23**

Title **HP STEAM GLAND BORE CHECKS - BOXES 'A','B', 'D' & 'E'**

Contract	**INTERMOUNTAIN**	Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date **17/02/02**	Checked	**BI**	Check List No. **1175**
Taken by	Date	Supervisor	Date	Approved	Date





SF = Short Fin. LF = Long Fin.Readings in inches
F = Front End, R = Rear End

RING N0.	REQUD SIZE BOLTED	FIN	BORE - X			HALF JOINT GAP - G (0.001")				
			VERT BORE - V	HORIZONTAL			LHS		RHS	
				A	B		OUTER	INNER	INNER	OUTER
A1	N/A	Bore				FRONT				
A2	N/A	Bore				REAR				
B1	N/A	Bore								
B2	N/A	Bore	Not measured			FRONT				
B3	N/A	Bore				REAR				
B4	N/A	Bore								
D1	N/A	Bore								
D2	N/A	Bore	Not measured			FRONT				
D3	N/A	Bore				REAR				
D4	N/A	Bore								
E1	N/A	Bore				FRONT				
E2	N/A	Bore				REAR				

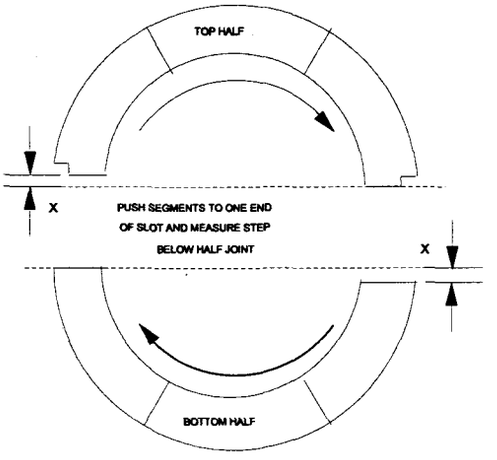
ALSTOM

RECORD SHEET **HP01/001** Page No. **6.24**

Title **GLAND RING BUTT CLEARANCE FOR HP SHAFT GLANDS**

Contract	**INTERMOUNTAIN**	Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date **17/02/02**	Checked	**BI**	Check List No. **1175**
Taken by	Date	Supervisor	Date	Approved	Date

FITTED BY TURBOCARE



IRRESPECTIVE OF THE NUMBER OF SEGMENTS BUTT CLEARANCE 'X' IS THE CUMULATIVE TOTAL OF ALL SEGMENTS IN EACH HALF RING

Readings in inches

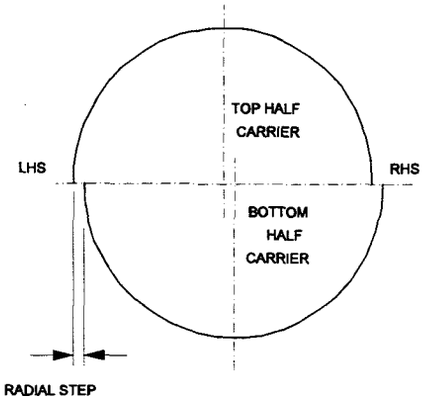
GLAND POSITION	RING NUMBER	BUTT CLEARANCE 'X'			
		DESIGN TOTAL	ACTUAL		
			TOP HALF	BOT HALF	TOTAL
'A'	1				
	2				
'B'	1				
	2				
	3				
	4				
	5				
'D'	1				
	2				
	3				
	4				
'E'	1				
	2				

ALSTOM

RECORD SHEET **HP/CL3** Page No. **6.25**

Title **HP GLANDBOX AXIAL AND RADIAL MISMATCH - BOXES 'A', 'D' & 'E'**

Contract	INTERMOUNTAIN	Unit No.	1	Serial No.	11246
Site Issue	A	Date	17/02/02	Checked	BI	Check List No.	1175
Taken by	Date	Supervisor	Date	Approved	Date

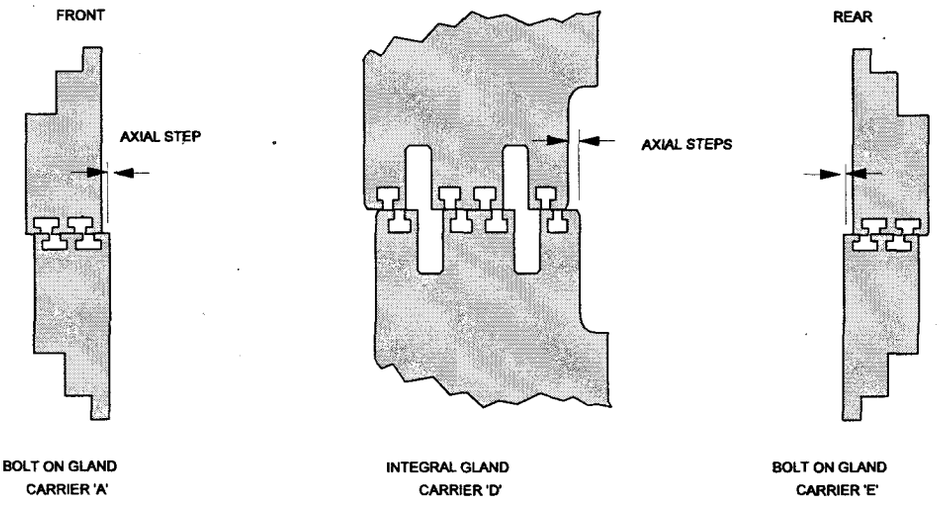


RADIAL OFFSET

Top half to the LHS read positive (+).
Top half to the RHS read negative(-).

AXIAL OFFSET

Top half to the front read positive (+)
Top half to the rear read negative(-).



Readings in inches

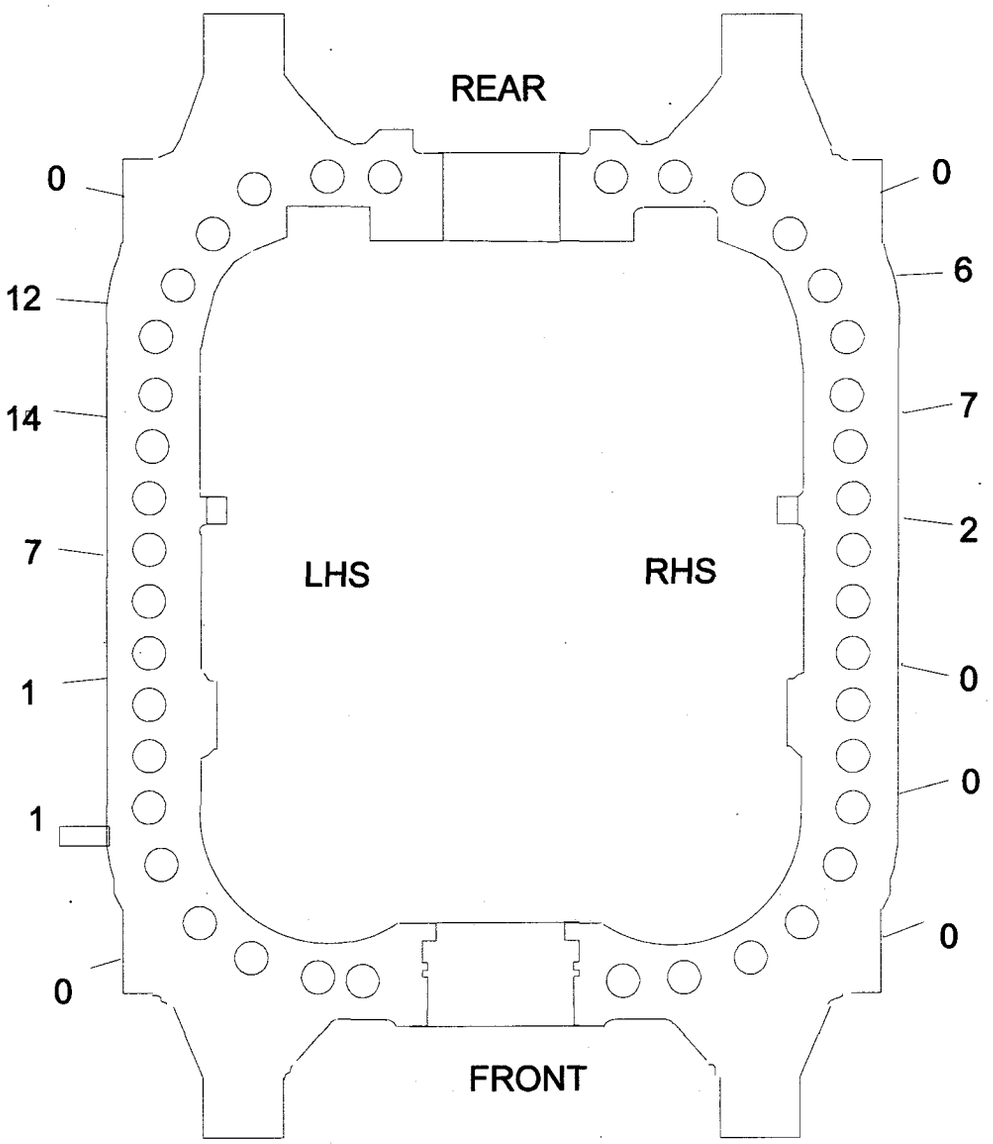
POSITION	RADIAL STEPS		AXIAL STEPS	
	LHS	RHS	LHS	RHS
Gland box 'A' Front	Refer to IPSC/Turbocare records		No significant mismatch	
Gland box 'A' Rear	"		"	
Gland box 'D' Front	"		"	
Gland box 'D' Rear	"		"	
Gland box 'E' Front	"		"	
Gland box 'E' Rear	"		"	

ALSTOM

RECORD SHEET **HP24/024** Page No. **6.26**

Title	**HP OUTER CYLINDER JOINT GAPS - UNBOLTED**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by IPSC	Date 3/3/03	Supervisor	MLS	Approved		Date	4/3/03

Readings are 0.001"



ALSTOM

RECORD SHEET **HP27/015** Page No. **6.27**

Title **HP STEAM INLETS CLEARANCES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

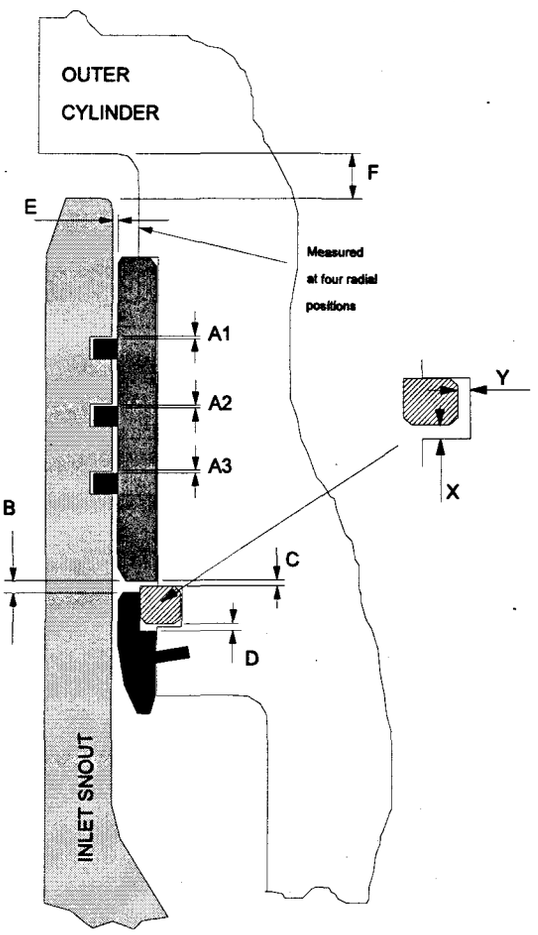
Site Issue **A** Date **13/3/02** Checked **BI** Check List No. **1175**

Taken by CFS Date 16/3/03 Supervisor M Storey Date 16/3/03 Approved [signature] Date 17/3/03

REF DRAWINGS :- R202/A0/5396 Rev. C, R202/A0/5387 Rev A

Readings in inches

		HP TURBINE INLETS			
POSITION	DESIGN	TOP LHS	TOP RHS	BOTT LHS	BOTT RHS
A1	.020/.027	.022	.020	.020	.021
A2	.020/.027	.021	.021	.020	.021
A3	.020/.027	.021	.021	.020	.021
B*	.035/.055	.048	.048	.039	.039
C*	.006/.016	.006	.006	.008	.009
D*	0.024/.040	.030	.030	.030	.030
X	0.004/.008	.006	.004	.005	.005
Y	0.008/.018	.012	.013	.011	.011
E L/R min.	.040 min.	.114	.118	.113	.113
E F/R min.	.080 min.	.098	.085	.096	.073
F*	.315/.472	Refer to HP/M16 &HP/M16A (p7.6-7)			
SEALING RING OVERLAP CLRC	DESIGN				
	RING 1	.421	.421	.421	.421
	RING 2	.421	.421	.421	.421
	RING 3	.421	.421	.421	.421



* Notes

1.Clearances 'B', 'C' & 'D' to be confirmed after machining components to suit dimensions measured on Record Sheets HP/M6 and M6A (Section 7).

2.Clearance 'F' derived from measurements on Record Sheets HP/M16 and M16A (Section 7)

ALSTOM

RECORD SHEET **HP27/019** Page No. **6.28**

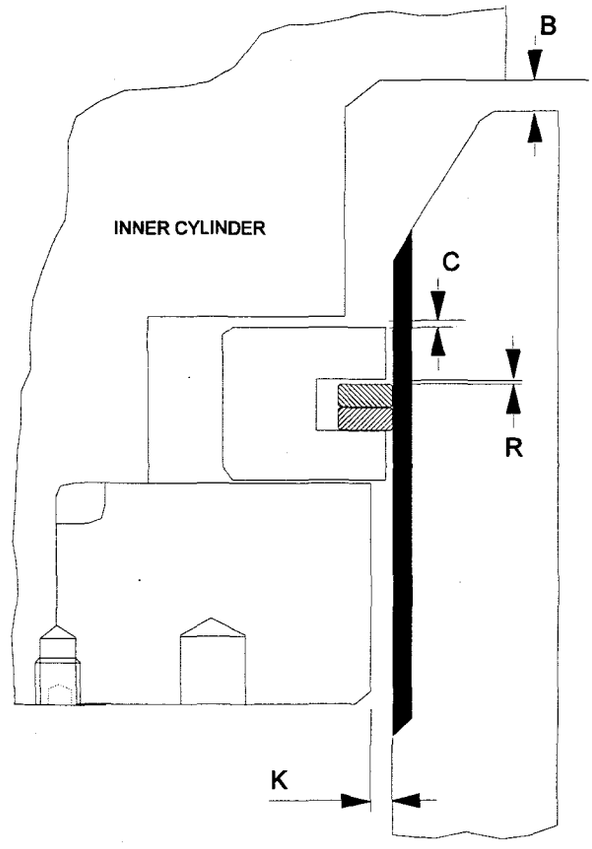
Title **HP HEATER CONNECTION ASSEMBLY**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **3/3/02** Checked **BI** Check List No. **1175**

Taken by B Grierson Date 16/3/03 Supervisor **BG** Date16/3/03 Approved [signature] Date 4/3/03

REF DRAWING :- R202/A1/5380 Rev A



Readings in inches

	RADIAL		AXIAL		
	L	K	C	R	B
DESIGN	N/A	.040/.438	.016/.024	.016/.028	.217/.413
CARRIER L/R	---	.215 min	.020	.016	.315
CARRIER F/R	---	.224 min	.020	.016	.315

RING END CLRC	RING 1A	RING 1B	RING 2A	RING 2B
DES = .106/.118	Works assembled		N/A	N/A

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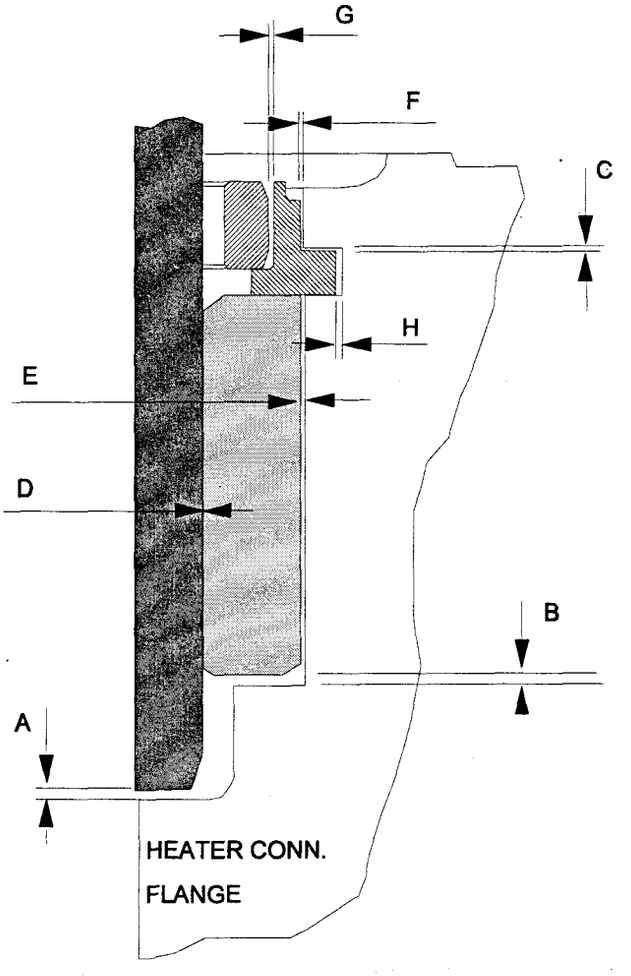
RECORD SHEET **HP/M--** Page No. **6.29**

Title	**HP HEATER CONNECTION FLANGE CLEARANCES**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**15/03/02**	Checked	**BI**	Check List No.	**1175**
Taken by	CFS	Date 18/3/03	Supervisor	Date	Approved		Date 18/3/03

REF DWG:- R202/AO/5396 REV C



Readings in inches

POSITION	A	B	C	D	E	F/G	H
DESIGN	.039/.079	.015/.025	.010/.015	-.001/-.003	.001/.003	.0004/.004	.008/.018
ACTUAL	**.050**	**.020**	**.013**	**-.001/.002**	**.003**	**.004**	**.015**

Final length of spool =

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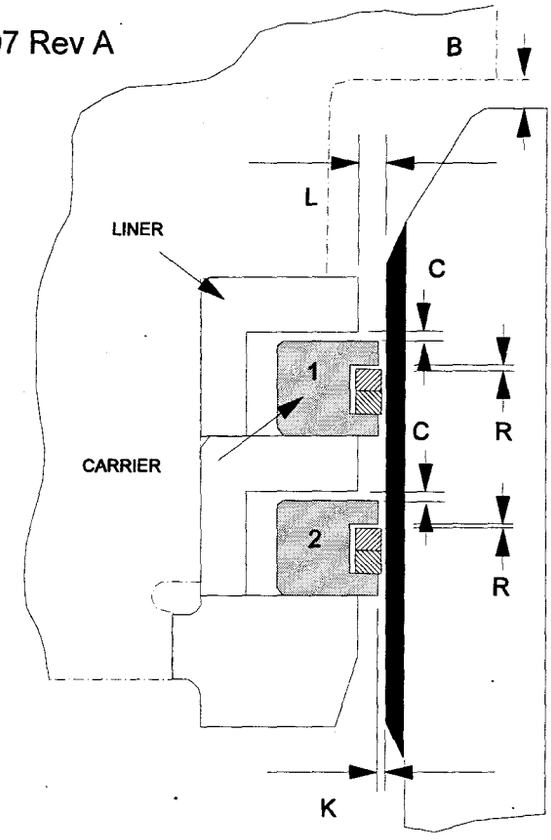
RECORD SHEET **HP27/019** Page No. **6.30**

Title **HP LEAKOFF FOR IP ROTOR COOLING CONNECTION ASSEMBLY**

Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**3/3/02**	Checked	**BI**	Check List No.	**1175**
Taken by BG	Date 16/3/03	Supervisor		Date	Approved		Date 17/3/03

REF DRAWING :- R202/A0/5397 Rev A



Readings in inches

	RADIAL		AXIAL		
	L	K	C	R	B
DESIGN	.035/.279	0.020/.026	.024/.031	.017/.027	.472/.551
CARRIER 1	L/R .130 min F/R .278 min	NR	Works fitted components		.531
CARRIER 2	"	NR			

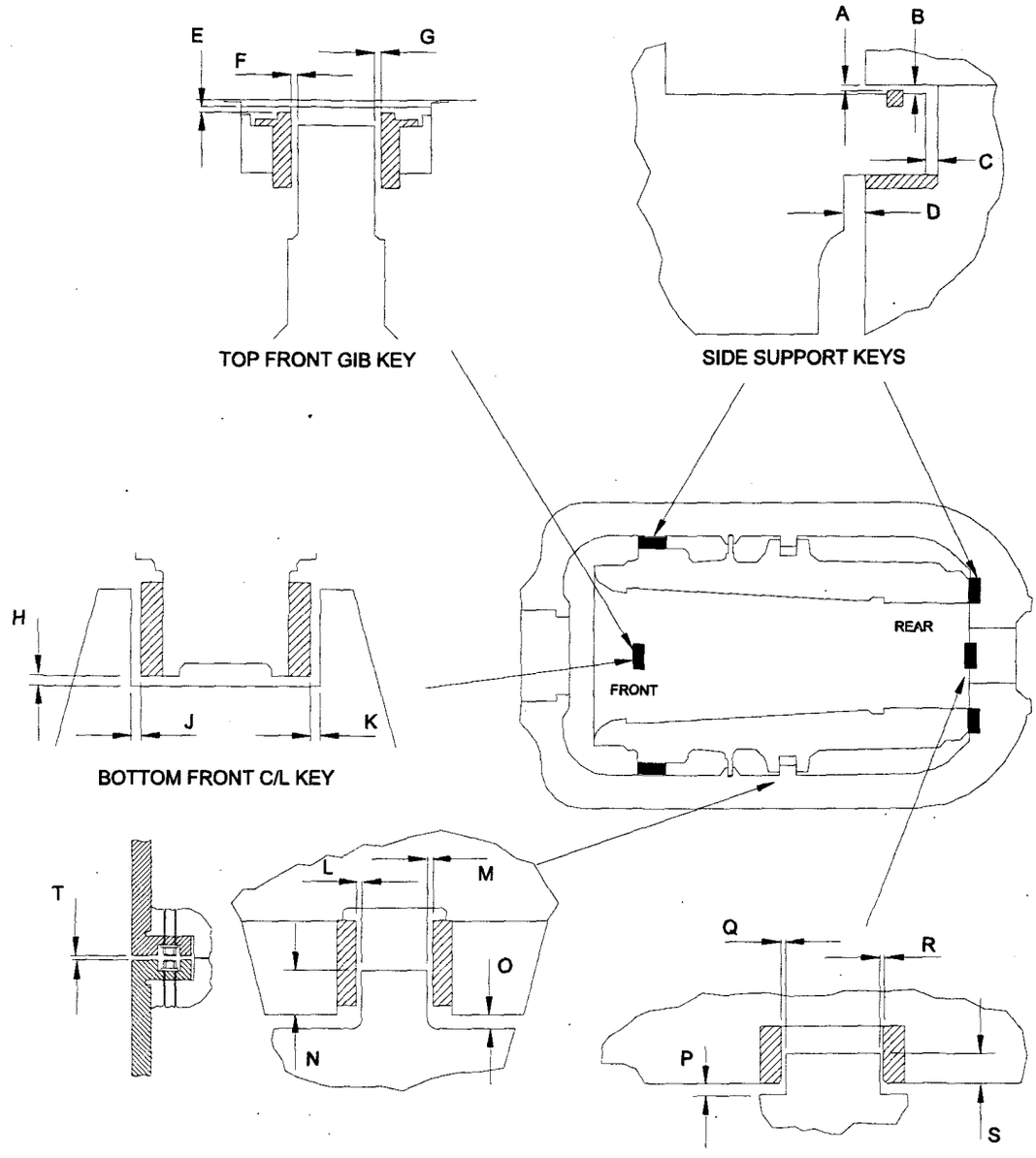
RING END CLRC	RING 1A	RING 1B	RING 2A	RING 2B
DES = 0.106/118	Works fitted components			

ALSTOM

RECORD SHEET **HP26/008 Sht 1 of 2** Page No. **6.31**

Title	**HP INNER TO OUTER CYLINDER KEY CLEARANCES**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by	Date	Supervisor		Date	Approved		Date

REF DWG:- R202/AO/5396 REV C



ALSTOM

RECORD SHEET **HP26/008 Sht 2 of 2** Page No. **6.32**

Title **HP INNER TO OUTER CYLINDER KEY CLEARANCES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by Various Date March 03 Supervisor MLS/BG Date Mar 03 Approved W.H.Blakeney Date 26/3/03

REF DWG:- R202/AO/5396 REV C

Readings in inches

SIDE SUPPORT KEYS

	A		B		C		D	
	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
FRONT LHS KEY	.006/.008	.008	.031 MIN	.056	.250/.590	.424	.490/ 1.100	.810
FRONT RHS KEY		.008		.050		.480		.809
REAR LHS KEY	.006/.008	.008	.031 MIN	.042	.250/.590	.629	.490/ 1.100	.984
REAR RHS KEY		.006		.034		.552		1.009

FRONT TRANSVERSE LOCATING KEYS

TOP KEY	E	F + G	BOTTOM KEY	H	J + K
DESIGN	.010/.030	.004/.006	DESIGN	.250/.400	.004/.006
ACTUAL	0.025	0.004	ACTUAL	.375	004

AXIAL LOCATING KEYS

	L + M		O		N		T (Design= .004/.027)	
	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL	POSITION	ACTUAL
LHS TOP	.004/.006	NR	.250/.420	NR	1.000 MIN	NR	LH Front	.024
RHS TOP		NR		NR		NR	LH Rear	.027
LHS BOT		.004		.804		2.5	RH Front	.030
RHS BOT		.004		.764		2.5	RH Rear	.020

REAR TRANSVERSE LOCATING KEYS

	P		Q + R		S	
	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
TOP	0.250 MIN 0.400 MAX	NR	.004/.006	.006	1.000 MIN	1.5
BOTTOM		NR		.004		1.5

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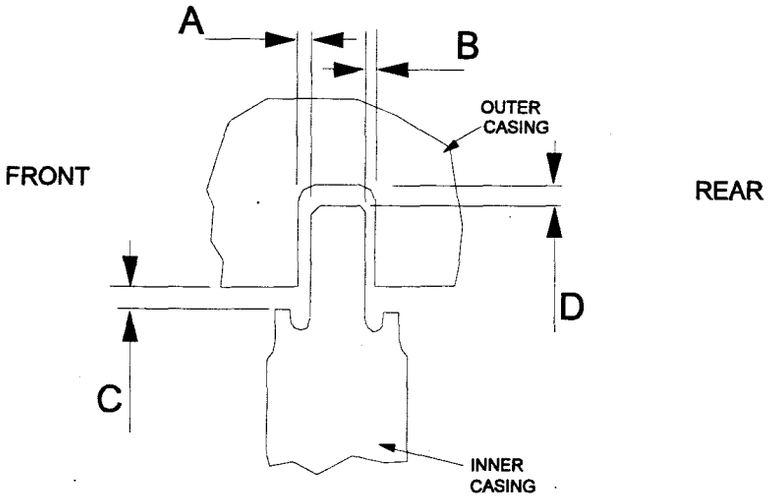
RECORD SHEET **HP28/002** Page No. **6.33**

Title **HP INNER TO OUTER CYLINDER BAFFLE ASSEMBLY CLEARANCES**

Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**19/3/02**	Checked	**BI**	Check List No.	**1175**
Taken by B Grierson	Date 18/3/03	Supervisor	BG	Date	Approved	Date	18/3/03

REF DWG :- R202(AO)5396 Sht 3 Rev C



INNER/OUTER CYLINDERS
IN FINAL AXIAL RELATIONSHIP

Readings in inches

POSITION	DESIGN	BOTTOM HALF BAFFLE		*TOP HALF BAFFLE	
		LHS	RHS	LHS	RHS
AXIAL - A	.039/.200	.125	.115	*	*
AXIAL - B	.039/.200	.128	.138	*	*
RADIAL - C	.160/.250	.129	.123	*	*
RADIAL - D	.200/.275	.213	.212	*	*

* No significant steps between top and bottom halves

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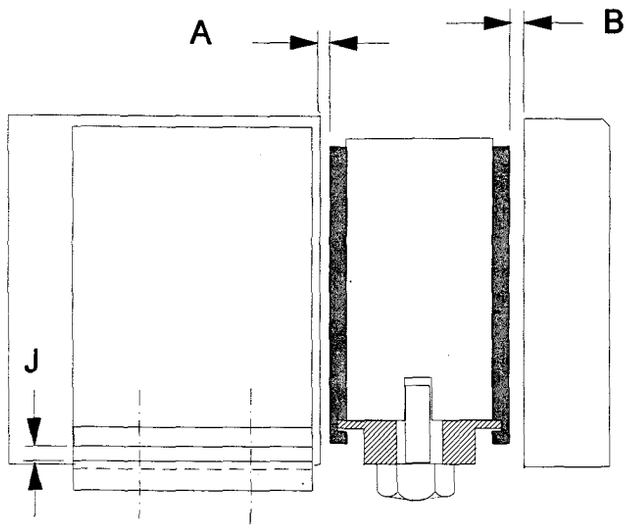
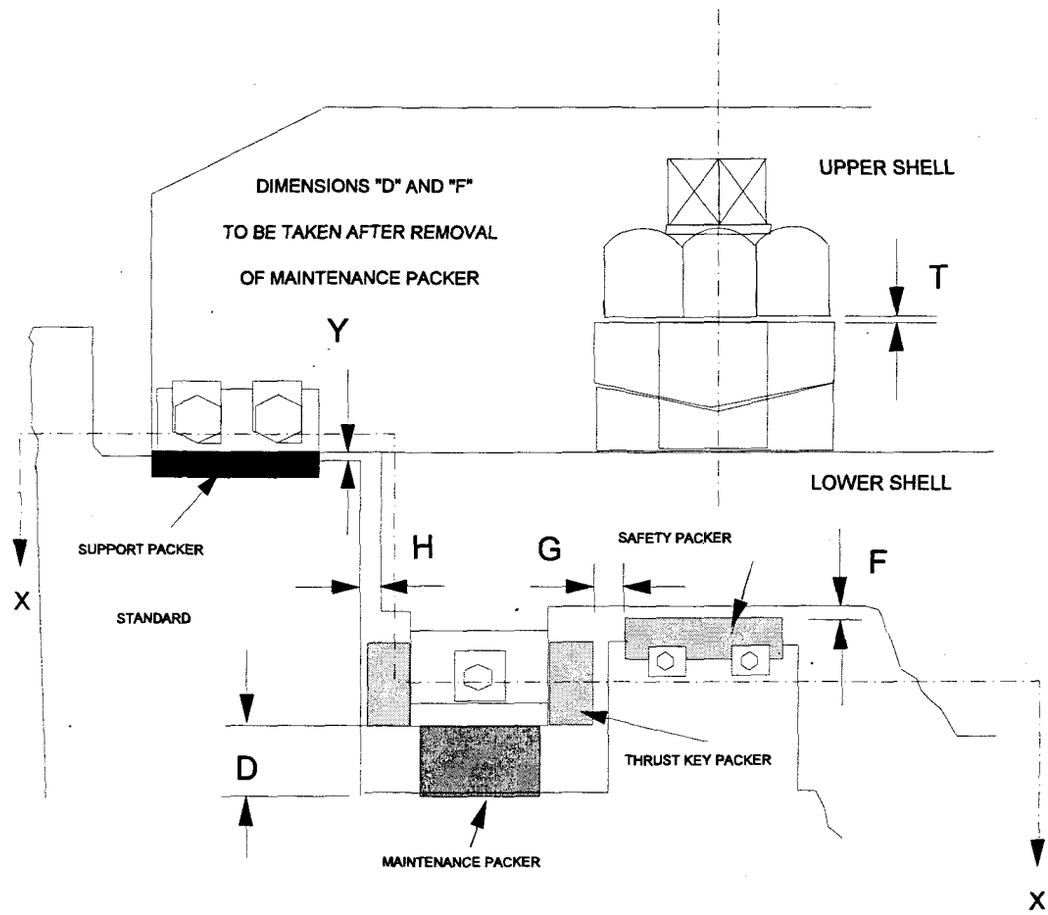
RECORD SHEET **HP23/010 Sht 1 of 2** Page No. **6.34**

Title	**HP CYLINDER THRUST KEY & PAW GRIP CLEARANCES**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by	Date	Supervisor		Date	Approved		Date



SECTION ON
'X - X'



SIDE VIEW ON TYPICAL FRONT-END THRUST KEY

6 - HP REBUILD

IP7_006271

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RECORD SHEET **HP23/010 Sht 2 of 2** Page No. **6.35**

Title **HP CYLINDER THRUST KEY & PAW GRIP CLEARANCES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by W Falconer Date 26/3/03 Supervisor Date Approved [signature] Date 26/3/03

Readings in inches

THRUST KEY PACKER CLEARANCE - "A+B" (TOTAL)		DESIGN =
CYLINDER LHS	LH FRONT KEY	LH REAR KEY
	0.002	0.003
CYLINDER RHS	RH FRONT KEY	RH REAR KEY
	0.002	0.003

TOP PALM TO STANDARD CLEARANCE 'J' =		SAFETY PACKER CLEARANCE	SAFETY PACKER TO LOWER PALM CLEARANCE 'F'
LH FRONT	NR	LH FRONT	0.063
LH REAR	NR	LH REAR	0.050
RH FRONT	NR	RH FRONT	0.062
RH REAR	NR	RH REAR	0.050

MAINTENANCE PACKER GAP - 'D'		PALM TO STANDARD GAP - 'Y'	
LH FRONT KEY	LH REAR KEY	LH FRONT KEY	LH REAR KEY
1.015	1.043	0.293	0.323
RH FRONT KEY	RH REAR KEY	RH FRONT KEY	RH REAR KEY
1.027	1.054	0.295	0.220

BOTTOM PALM TO STANDARD CLEARANCE - 'H'			
LH FRONT KEY	0.572	LH REAR KEY	0.478
RH FRONT KEY	0.590	RH REAR KEY	0.464

SAFETY PACKER TO THRUST KEY PACKER CLEARANCE - 'G'			
LH FRONT	0.352	LH REAR	0.070
RH FRONT	0.018	RH REAR	0.228

RETAINING BOLT CLEARANCE - 'T'			
LH FRONT		LH REAR	
RH FRONT		RH REAR	

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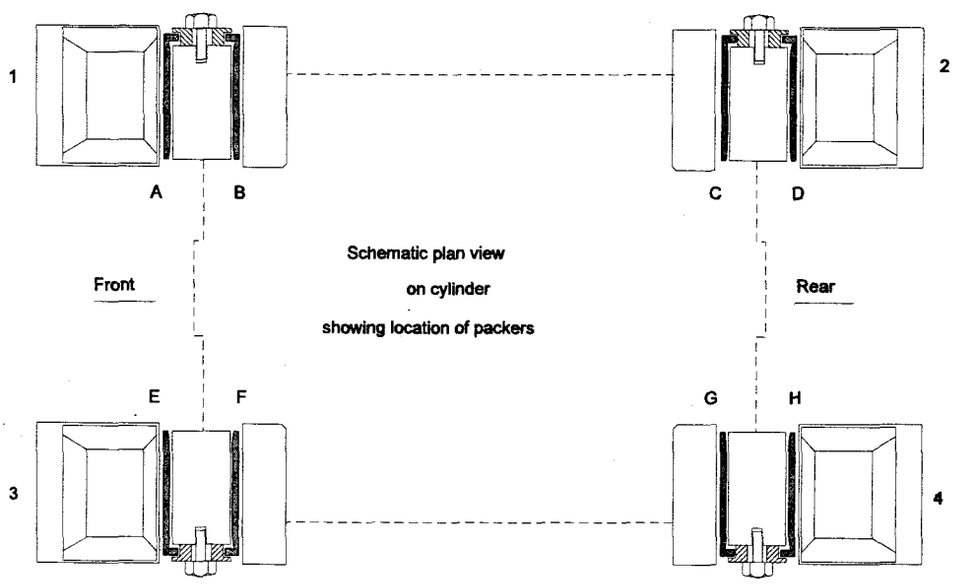
RECORD SHEET **HP23/005** Page No. **6.36**

Title **HP CYLINDER THRUST KEY & SUPPORT PACKER THICKNESSES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by Date Supervisor B. GRIELSON Date 26/3/03 Approved [illegible] Date 26/3/03



Readings in inches

THRUST KEY PACKER THICKNESSES	A	B	C	D
	As stripdown	As stripdown	1.100	0.642
	E	F	G	H
	As stripdown	As stripdown	1.131	0.632
CYLINDER PAW KEY WIDTH	LH FRONT	As stripdown	LH REAR	As stripdown
	RH FRONT	As stripdown	RH REAR	As stripdown
PEDESTAL KEYWAY WIDTH	LH FRONT	As stripdown	LH REAR	As stripdown
	RH FRONT	As stripdown	RH REAR	As stripdown
SUPPORT PACKER THICKNESS	LH FRONT	LH REAR	RH FRONT	RH REAR
	1.044	1.072	1.042	1.076
TEMPORARY SUPPORT PACKER THICKNESS	LH FRONT	As stripdown	LH REAR	As stripdown
	RH FRONT	As stripdown	RH REAR	As stripdown

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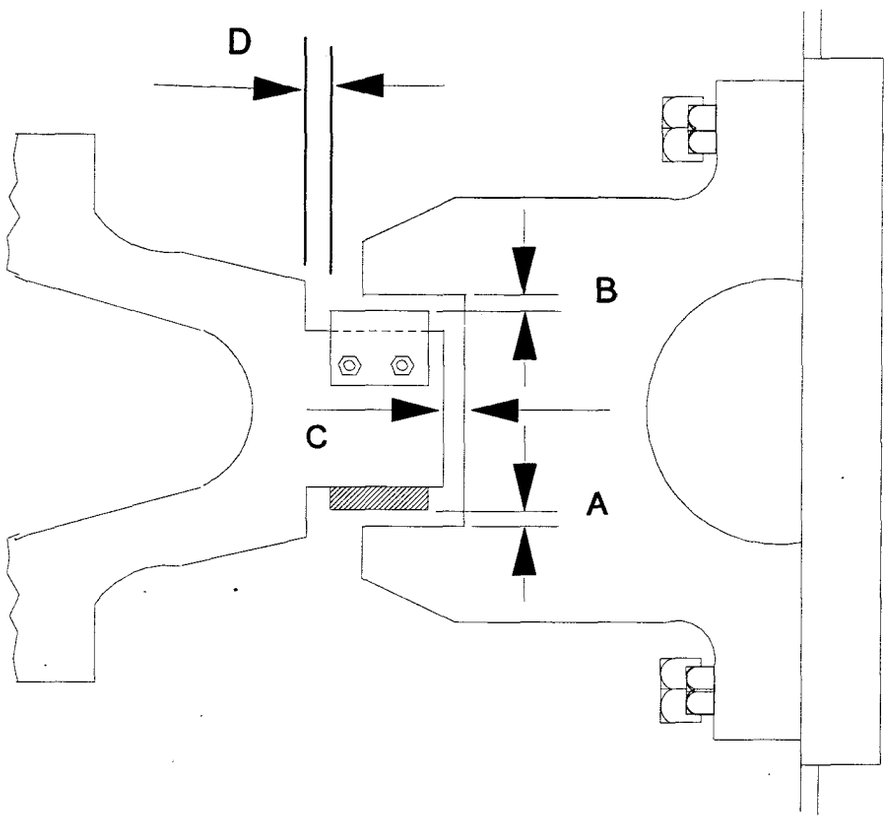
RECORD SHEET **HP21/003** Page No. **6.37**

Title **HP CYLINDER TO PEDESTAL CENTRE LINE KEY CLEARANCES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by IPSC Date Supervisor Date Approved Date 26/3/03



PLAN VIEW ON TYPICAL KEY ASSEMBLY

Readings in inches

CYLINDER POSITION	KEY POSITION	(A +B)		C		D	
		DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
FRONT	TOP		N/A		N/A		N/A
	BOTTOM		0.003		NO CHANGE		NO CHANGE
REAR	TOP		N/A		N/A		N/A.
	BOTTOM		0.005		NO CHANGE		NO CHANGE

ALSTOM

RECORD SHEET **HP25/001** Page No. **6.38**

Title **HP CYLINDER COMPONENT BOLTS - TORQUE SETTINGS**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by Date Supervisor Date Approved Date 26/3/03

Drawing Ref. R212/A0/3856 Rev A, R265/A0/9371 Rev A, R265/A0/9372 - 9378 Rev B

LOCATION	ITEM NO.	QTY.	SIZE	DESIGN		ACTUAL
				Ft.Lb.	Nm	
HP INLET GLAND	3	4	2¼"-8UN -2A	3584	4859	
"	4	6	2"-8UN -2A	2580	3499	
"	5	6	1¼"-8UN -2A	608	824	
"	9	2	1"-8UN -2A	216	293	
STAGE 1 DIAPHRAGM	12	2	⅝"-11UN -2A	51	70	
STAGE 2 DIAPHRAGM	12	2	1⅜"-8UN -2A	583	791	
"	13	2	1"-8UN -2A	216	293	
STAGE 3 DIAPHRAGM	12	2	1⅜"-8un -2A	583	791	
"	13	2	1"-8UN -2A	216	293	
STAGE 4 DIAPHRAGM	12	2	1⅛"-8UN -2A	313	424	
"	13	2	1" 8UN -2A	216	293	
STAGE 5 DIAPHRAGM	12	2	1⅛"-8UN -2A	313	424	
"	13	2	1" 8UN -2A	216	293	
STAGE 6 DIAPHRAGM	12	2	1⅛"-8UN -2A	313	424	
"	13	2	1" 8UN -2A	216	293	
STAGE 7 DIAPHRAGM	12	2	1⅛"-8UN -2A	313	424	
"	13	2	1" 8UN -2A	216	293	
STAGE 7 DIAPHRAGM	12	2	1⅛"-8UN -2A	313	424	
"	13	2	1" 8UN -2A	216	293	

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RECORD SHEET **HP25/002** **Sht 1** **of 2** Page No. **6.39**

Title **CONTROLLED TIGHTENING OF HP INNER CYLINDER BOLTS**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken W Gasser Date 21/3/03 Supervisor M Storey Date 21/3/03 Approved [signature] Date 21/3/03

JOINT BEING TIGHTENED : HP INNER CYLINDER HALF JOINT

DRAWING REFERENCE : R200/A3/10344

METHOD OF TIGHTENING : HEATING

REAR (GENERATOR END) Readings in inches

LHS FLANGE JOINT

BOLT No.	MEASUREMENT		EXTENSION	
	BEFORE	AFTER	ACTUAL	DESIGN
11	.714	.739	**0.025**	.025/.031
23	.536	.580	**0.044**	.037/.045
7	.547	.592	**0.045**	.037/.045
19	.541	.583	**0.042**	.037/.045
3	.533	.571	**0.038**	.037/.045
15	.538	.579	**0.041**	.037/.045
1	.718	.749	**0.031**	.025/.031
17	.545	.578	**0.033**	.029/.035
5	.548	.580	**0.032**	.029/.035
21	.547	.576	**0.029**	.029/.035
27	.428	.459	**0.031**	.025/.031
9	.429	.461	**0.032**	.025/.031
25	.430	.460	**0.030**	.025/.031
13	.431	.458	**0.027**	.025/.031

RHS FLANGE JOINT

BOLT No.	MEASUREMENT		EXTENSION	
	BEFORE	AFTER	ACTUAL	DESIGN
12	.727	.752	**0.025**	.025/.031
24	.528	.573	**0.045**	.037/.045
8	.571	.612	**0.041**	.037/.045
20	.541	.579	**0.038**	.037/.045
4	.549	.588	**0.039**	.037/.045
16	.530	.571	**0.041**	.037/.045
2	.718	.749	**0.031**	.025/.031
18	.547	.578	**0.031**	.028/.035
6	.548	.578	**0.030**	.028/.035
22	.523	.556	**0.033**	.028/.035
28	.422	.453	**0.031**	.025/.031
10	.415	.446	**0.031**	.025/.031
26	.428	.453	**0.025**	.025/.031
14	.429	.460	**0.031**	.025/.031

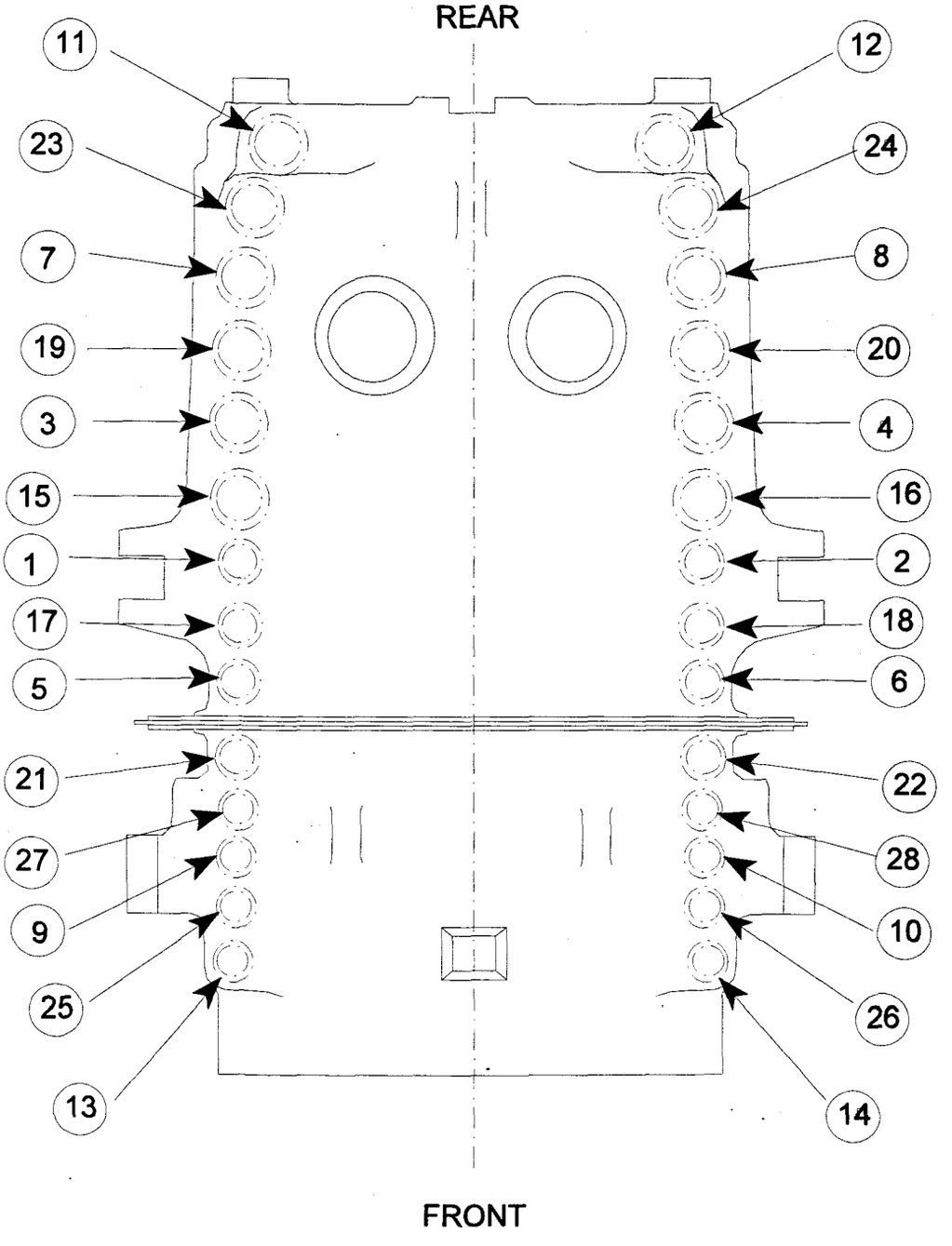
FRONT (TURBINE) END

THE IDENTIFICATION NUMBERS ARE MARKED ON THE STUDS AND NUTS

IT IS ESSENTIAL THAT THE STUDS ARE CHECKED AND RE-TIGHTENED PROGRESSIVELY.

ALSTOM

RECORD SHEET	HP25/002	Sht 2	of 2			Page No.	6.40
Title	TIGHTENING SEQUENCE FOR HP INNER CYLINDER BOLTS						
Contract	INTERMOUNTAIN			Unit No.	1	Serial No.	11246
Site Issue	A	Date	17/02/02	Checked	BI	Check List No.	1175
Taken by	Date	Supervisor	Date	Approved		Date	



ALSTOM

RECORD SHEET **HP16/007 Sht 1of 3** Page No. **6.41**

Title **HP OUTER SHELL DISTORTION MEASUREMENTS - LASER**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **5/3/03** Checked **WHF** Check List No. **1175**

Taken by M Morris LMS Date 12/3/03 Supervisor Date Approved [signature] Date 13/3/03

Readings referenced to outer cylinder (gland locations A2 and E2)

Note: For horizontal positive no. = Right For vertical positive no. = Up

Readings in inches

POSITION OF GLAND	HORIZONTAL TOPS OFF	HORIZONTAL TOPS ON	HORIZONTAL SHIFT	VERTICAL TOPS OFF	VERTICAL TOPS ON	VERTICAL SHIFT
T1 bore	0.023	0.024	0.002	0.012	0.009	-0.004
A1	0.003	0.004	0.001	0.006	0.004	-0.003
A2	0	0	0	0	0	0
B1	0.002	0.004	0.002	0.012	0.004	-0.008
B2/3	0.002	0	-0.002	0.018	0.004	-0.014
B5	0.002	-0.001	-0.003	0.026	0.008	-0.018
St 8	-0.006	-0.002	0.005	-0.004	-0.020	-0.016
St 2	-0.004	-0.003	0.001	-0.003	-0.016	-0.013
C1	0.002	0.002	0.001	-0.005	-0.017	-0.012
C7	0.002	0.001	-0.001	-0.006	-0.016	-0.010
D1	0	0	0	0.001	0	-0.001
D2/D3	-0.002	0-.002	0	0.006	0.005	-0.001
D4	-0.002	-0.002	0	0.011	0.008	-0.003
E2	0	0	0	0	0	0
T2 bore	0.005	0.004	0	-.016	-0.034	-0.018

ALSTOM

RECORD SHEET **HP16/007 Sht 2of 3** Page No. **6.42**

Title **HP OUTER SHELL DISTORTION MEASUREMENTS - LASER**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **5/3/03** Checked **WHF** Check List No. **1175**

Taken by M Morris LMS Date 12/3/03 Supervisor Date Approved W H Dalloway Date 13/3/03

Readings referenced to the T1 -T2 rotor bearings boreline

horizontal positive no. = Right For vertical positive no. = Up

Readings in inches

POSITION OF GLAND	HORIZONTAL TOPS OFF	HORIZONTAL TOPS ON	HORIZONTAL SHIFT	VERTICAL TOPS OFF	VERTICAL TOPS ON	VERTICAL SHIFT
T1 bore	0	0	0	0	0	0
A1	-0.020	-0.020	-0.001	-0.005	-0.004	0.002
A2	-0.022	-0.023	-0.002	-0.011	-0.006	0.005
B1	-0.020	-0.019	0	0.002	-0.002	-0.003
B2/3	-0.018	-0.022	-0.004	0.009	0.001	-0.008
B5	-0.018	-0.022	-0.004	0.020	0.008	-0.012
St 8	-0.024	-0.021	0.003	-0.009	-0.017	-0.008
St 2	-0.016	-0.016	0.001	0.001	0	-0.001
C1	-0.009	-0.009	0	0.002	0.003	0.001
C7	-0.007	-0.008	-0.001	0.005	0.010	0.005
D1	-0.008	-0.009	0	0.012	0.026	0.014
D2/D3	-0.010	-0.010	0	0.018	0.033	0.015
D4	-0.009	-0.009	0	0.024	0.037	0.013
E2	-0.006	-0.006	0	0.015	0.032	0.017
T2 bore	0	0	0	0	0	0

ALSTOM

RECORD SHEET **HP16/007 Sht 3of 3** Page No. **6.43**

Title **HP OUTER SHELL DISTORTION MEASUREMENTS - LASER**

Contract **INTERMOUNTAIN** Unit No. *1* Serial No. **11246**

Site Issue **A** Date **26/03/02** Checked **BI** Check List No. **1175**

Taken by M Morris LMS Date 12/3/03 Supervisor Date Approved [signature] Date 13/3/03

HP final alignment corrections for tops on condition

Note: For horizontal positive no. = Right For vertical positive no. = Up

Readings in inches

GLAND POSITION	IDEAL HORIZONTAL	IDEAL VERTICAL (excld'g ovality)	CORRECTED HORIZONTAL	CORRECTED VERTICAL	HORIZONTAL CORRECTION	ELEVATION CORRECTION
A2	0	0	0	0	0	0
B1	0	-0.001	0.004	0.004	-0.004	-0.005
B2/3	0	-0.002	0	0.004	0	-0.006
B5	0	-0.003	-0.001	0.008	0.001	-0.011
St 8	0	-0.005	-0.002	-0.020	0.002	0.015
St 2	0	-0.006	-0.003	-0.016	0.003	0.010
C1	0	-0.005	0.002	-0.017	-0.002	0.012
C7	0	-0.003	0.001	-0.016	-0.001	0.013
D1	0	-0.002	0	0	0	-0.002
D2/D3	0	-0.001	-0.002	0.005	0.002	-0.006
D4	0	0	-0.002	0.008	0.002	-0.008
E2	0	0	0	0	0	0

ALSTOM

RECORD SHEET **HP18/001** Page No. **6.44**

Title **HP CYLINDER FINAL BOX-UP CHECKS - INNER CYLINDER**

Contract	**INTERMOUNTAIN**	Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**17/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by	Date	Supervisor	Date	Approved	W Falconer	Date	19/3/03

THE FOLLOWING CHECKS ARE TO BE COMPLETED PRIOR TO FITTING THE TOP HALF INNER CYLINDER COVER

	CHECK	INSPECTED BY (SIGNATURE) ALSTOM	IPSC
1	ALL RELEVANT CHECKSHEETS COMPLETED AND APPROVED	W Falconer	
2	ROTOR UNBOXED BUMP CHECK COMPLETED	M.L. Storey	
3	ALL HORIZONTAL JOINTS CLEAN AND BURR FREE	B Grierson	
4	ALL GLAND ALIGNMENT KEYS AND DOWELS CORRECTLY FITTED	B Grierson	
5	ALL INTERNAL FITTINGS, PIPES, CLAMPS ETC FITTED	B Grierson	
6	ALL INSTRUMENTATION/CABLING FITTED WHERE APPLICABLE	N/A	
7	ALL FASTENERS LOCKED OFF TO THE REQUIRED STANDARD	B Grierson	
8	TV INSPECTION SATISFACTORILY COMPLETED	B Grierson	
9	ALL TEMPORARY ARRANGEMENTS USED TO PROTECT OPENINGS REMOVED	B Grierson	
10	WHERE CYLINDERS ARE TOP HALF SUPPORTED ENSURE THAT THE TEMPORARY SUPPORTS FOR THE BOTTOM HALF INNER CYLINDER ARE REMOVED	N/A	
11	ALL INTERNALS THOROUGHLY CLEAN	B Grierson	
12	CYLINDER BOXED-UP DATE	19 March '02	

ALSTOM

RECORD SHEET **HP18/001** Page No. **6.45**

Title **HP CYLINDER FINAL BOX-UP CHECKS - OUTER CYLINDER**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by Date Supervisor Date Approved W Falconer Date 22/3/02

THE FOLLOWING CHECKS ARE TO BE COMPLETED PRIOR TO FITTING THE TOP HALF OUTER CYLINDER COVER

	CHECK	INSPECTED BY (SIGNATURE) ALSTOM	IPSC
1	ALL RELEVANT CHECKSHEETS COMPLETED AND APPROVED	W Falconer	
2	ROTOR UNBOXED BUMP CHECK COMPLETED	B Grierson	
3	ALL HORIZONTAL JOINTS CLEAN AND BURR FREE	B Grierson	
4	ALL GLAND ALIGNMENT KEYS AND DOWELS CORRECTLY FITTED	B Grierson	
5	ALL INTERNAL FITTINGS, PIPES, CLAMPS ETC FITTED	B Grierson	
6	ALL INSTRUMENTATION/CABLING FITTED WHERE APPLICABLE	W Falconer	
7	ALL FASTENERS LOCKED OFF TO THE REQUIRED STANDARD	B Grierson	
8	TV INSPECTION SATISFACTORILY COMPLETED	B Grierson	
9	ALL TEMPORARY ARRANGEMENTS USED TO PROTECT OPENINGS REMOVED	B Grierson	
10	WHERE CYLINDERS ARE TOP HALF SUPPORTED ENSURE THAT THE TEMPORARY SUPPORTS FOR THE BOTTOM HALF INNER CYLINDER ARE REMOVED	B Grierson	
11	ALL INTERNALS THOROUGHLY CLEAN	B Grierson	
12	CYLINDER BOXED-UP DATE	22 March 2002	

ALSTOM

QC 001

CHECK SHEET ISSUE STATUS AND COMPLETION RECORD

CONTRACT **INTERMOUNTAIN** UNIT NO: **1** ST NO: **112 46**

CHECKLIST NO: **1175**

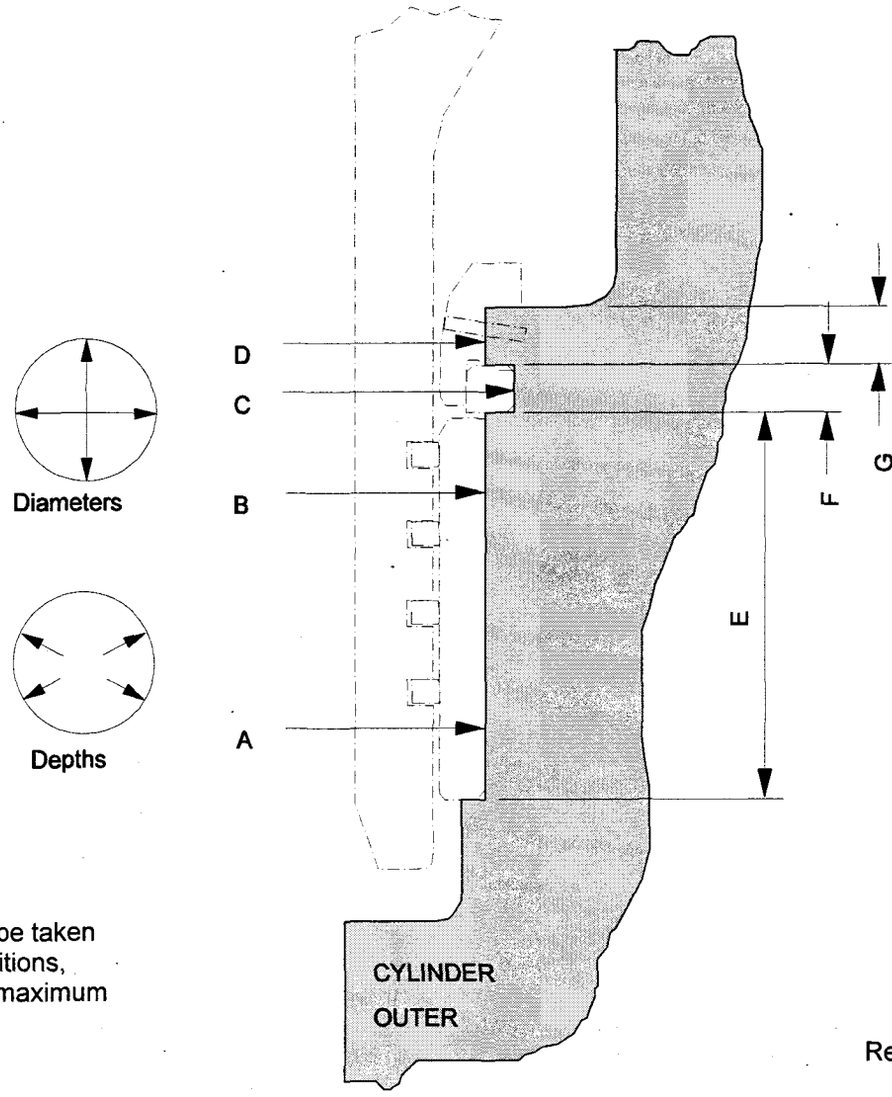
SECTION NO: **7** TITLE: **HP CYLINDER MACHINING DATA** Sheet 1 of 1

PAGE NO	RECORD SHT NO	DESCRIPTION	ISSUE	TS ENGR
7.1	HP/M6A	HP Bottom LHS steam inlet - Outer cyl. measurements	A	
7.2	HP/M6A	HP Bottom RHS steam inlet - Outer cyl. measurements	A	
7.3	HP/M6	HP Top LHS steam inlet - Outer cyl. measurements	A	
7.4	HP/M6	HP Top RHS steam inlet - Outer cyl. measurements	A	
7.5	HP/M--	HP Heater Connection Flange measurements	A	
7.6	HP/M16A	HP Bottom inlet pipe end clearance measurements	A	
7.7	HP/M16	HP Top inlet pipe end clearance measurements	A	
7.8	HP/M8	Front transverse location keys - outer cylinder measurements	A	
7.9	HP/M7	HP Inner cylinder holding down bolts - measurements	A	
7.10	HP/M13	HP Stubshaft spigot measurements (prior to machining)	A	
7.11	HP/M15	HP Bottom Outer Cylinder measurements	A	
7.12	HP/M15	HP Top Outer Cylinder measurements	A	
7.13	HP/M15	HP Outer cylinderRear Transverse Key measurements	A	

ALSTOM

RECORD SHEET **HP/M6A** Page No. **7.1**

Title	**HP BOTTOM LHS STEAM INLET - OUTER CYL. MEASUREMENTS**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**13/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by CFS	Date 8/3/03	Supervisor		Date		Approved	Date 9/3/03



All measurements to be taken at circumferential positions, to find minimum and maximum readings.

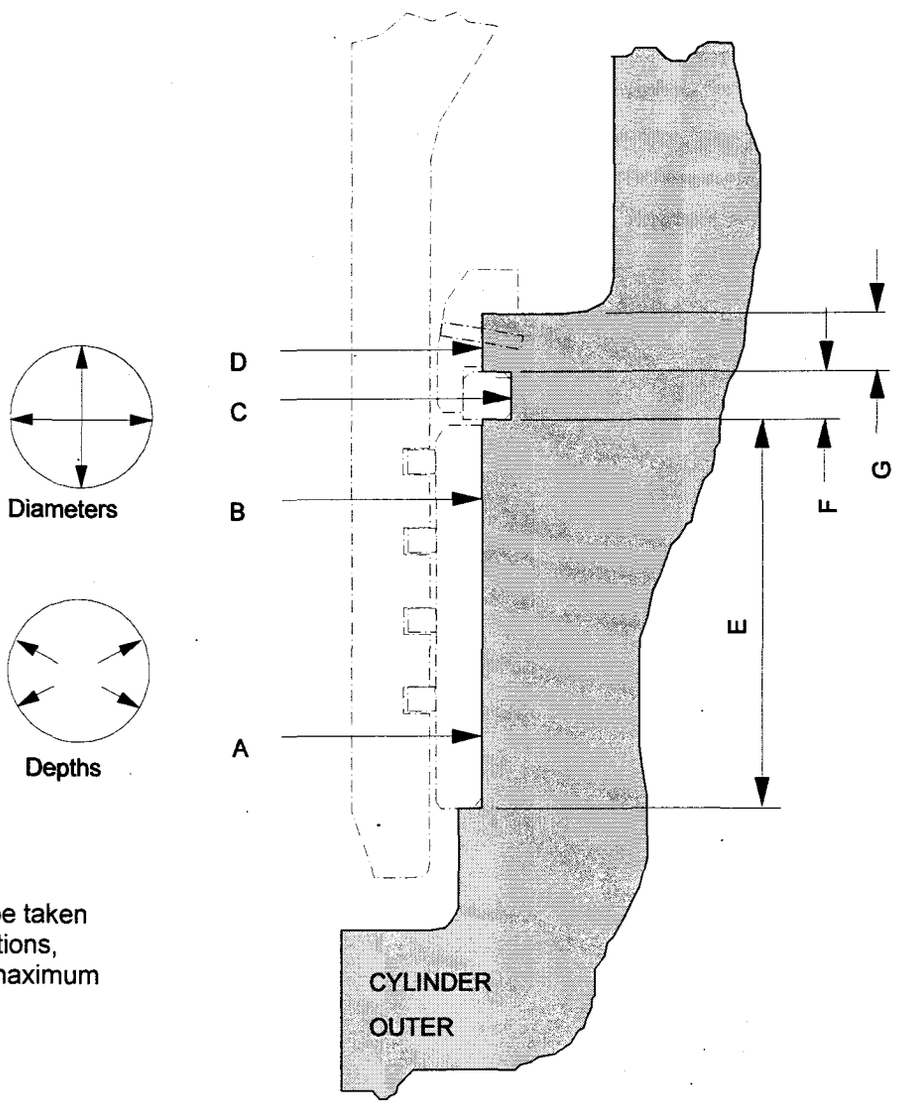
Readings in inches

POSITION	A	B	C	D	E	F	G
MIN	**16.021**	**16.021**	**16.906**	**16.0215**	**6.835**	**0.785**	**1.185**
MAX	**16.0215**	**16.0215**	**16.909**	**16.022**	**6.832**	**0.786**	**1.185**

ALSTOM

RECORD SHEET **HP/M6A** Page No. **7.2**

Title	**HP BOTTOM RHS STEAM INLET - OUTER CYL. MEASUREMENTS**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**13/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by	CFS	Date	8/3/03	Supervisor		Date	Approved [signature] Date 9/3/03



All measurements to be taken at circumferential positions, to find minimum and maximum readings.

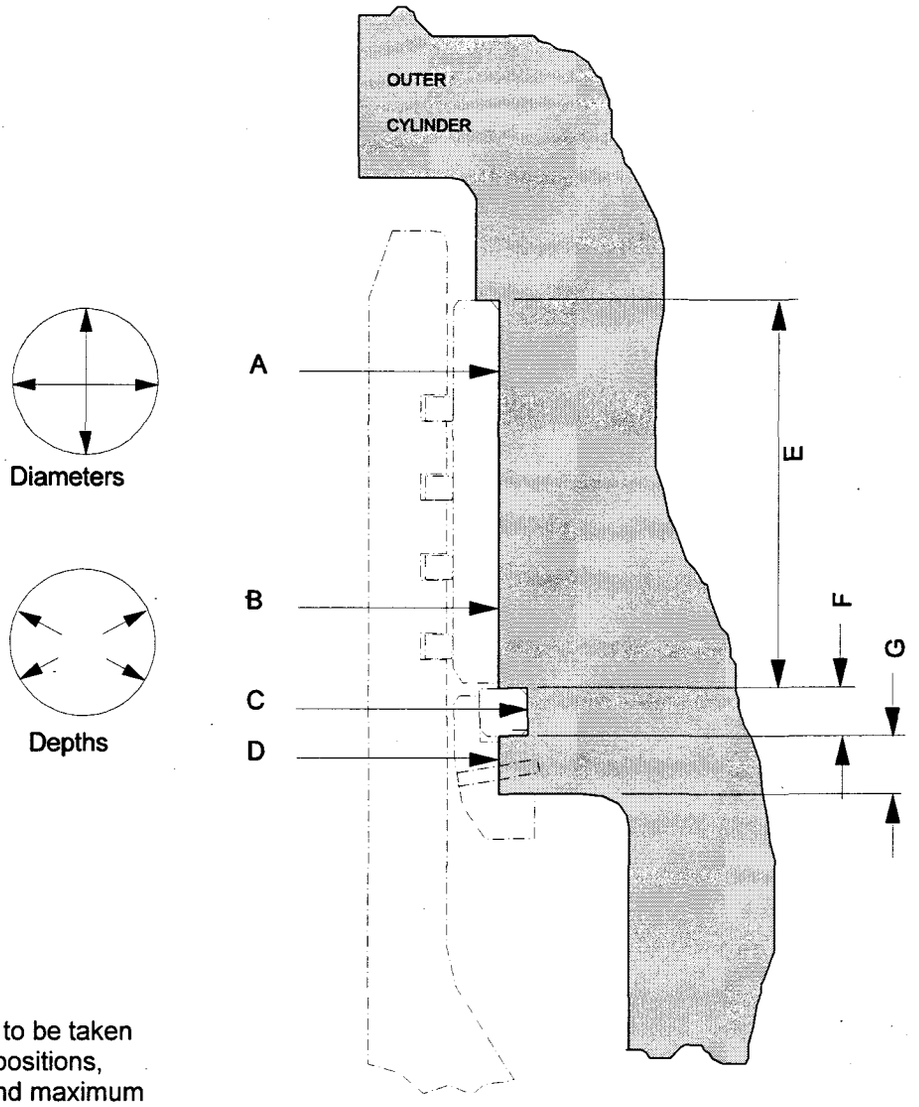
Readings in inches

POSITION	A	B	C	D	E	F	G
MIN	**16.013**	**16.012**	**16.884**	**16.018**	**6.858**	**0.766**	**1.180**
MAX	**16.0135**	**16.013**	**16.888**	**16.0195**	**6.860**	**0.766**	**1.180**

ALSTOM

RECORD SHEET **HP/M6** Page No. **7.3**

Title	**HP TOP LHS STEAM INLET - OUTER CYLINDER MEASUREMENTS**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**13/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by CFS	Date 8/3/03	Supervisor		Date	Approved		Date 9/3/03



All measurements to be taken at circumferential positions, to find minimum and maximum readings.

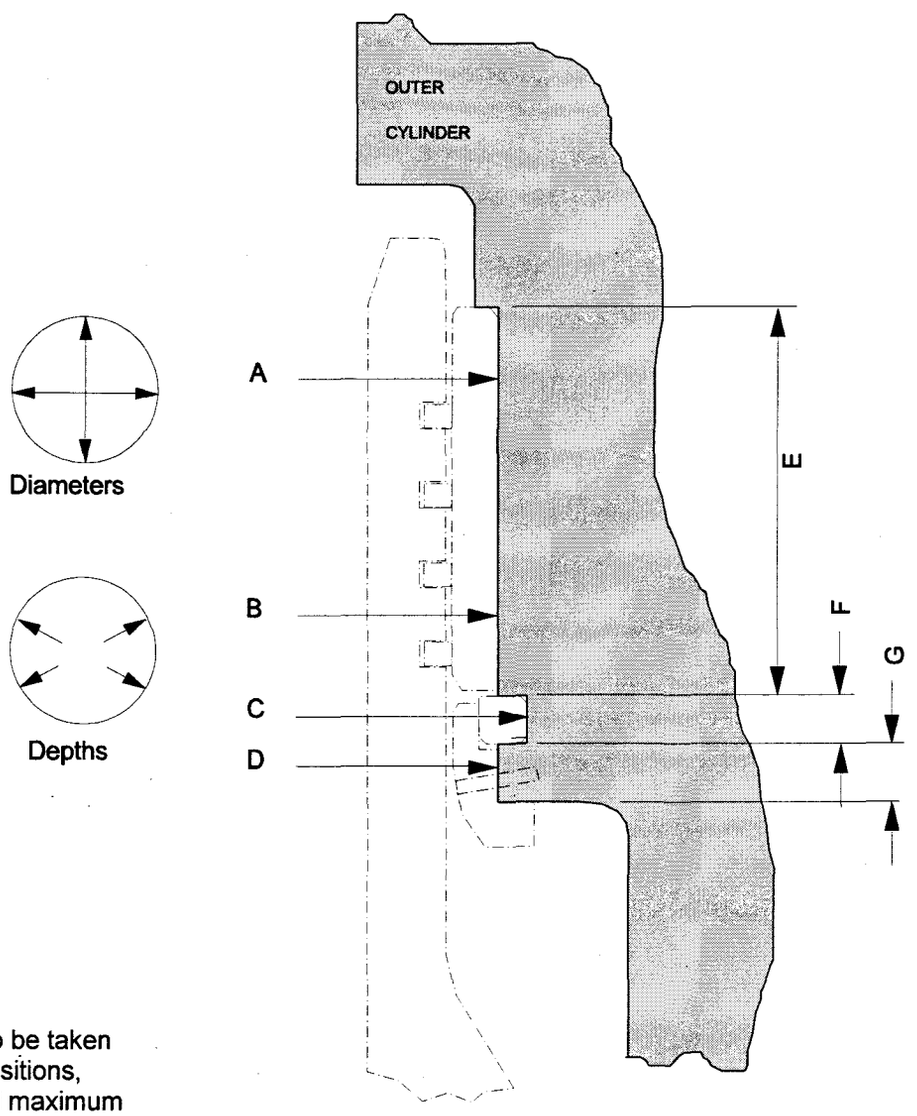
Readings in inches

POSITION	A	B	C	D	E	F	G
MIN	**16.020**	**16.021**	**16.900**	**16.022**	**6.845**	**0.789**	**1.183**
MAX	**16.022**	**16.022**	**16.904**	**16.024**	**6.850**	**0.790**	**1.185**

ALSTOM

RECORD SHEET **HP/M6** Page No. **7.4**

Title	**HP TOP RHS STEAM INLET - OUTER CYLINDER MEASUREMENTS**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**13/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by CFS	Date 8/3/03	Supervisor		Date	Approved		Date 9/3/03



All measurements to be taken at circumferential positions, to find minimum and maximum readings.

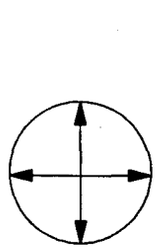
Readings in inches

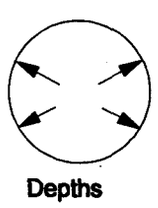
POSITION	A	B	C	D	E	F	G
MIN	**16.020**	**16.020**	**16.890**	**16.020**	**6.845**	**0.788**	**1.186**
MAX	**16.023**	**16.021**	**16.894**	**16.022**	**6.848**	**0.790**	**1.186**

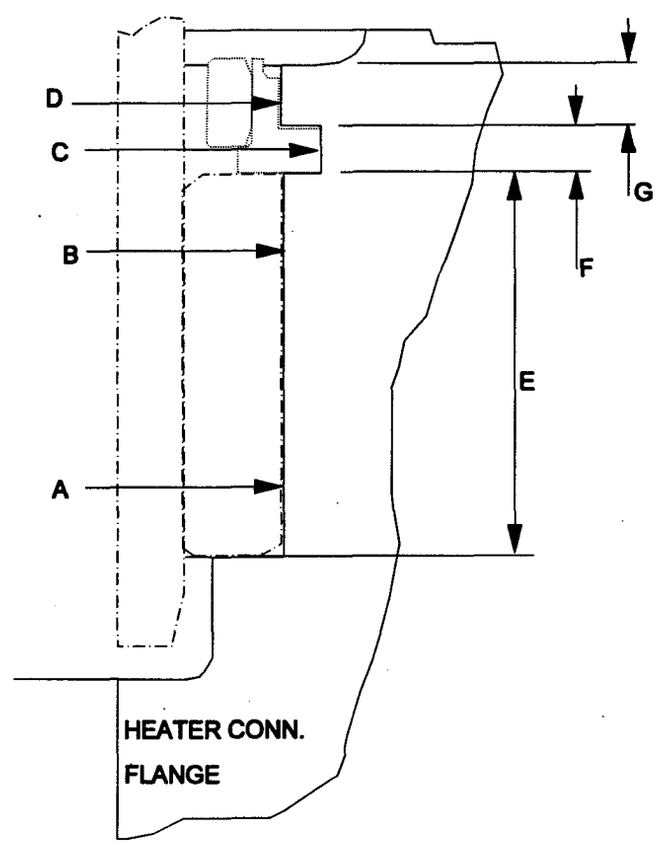
ALSTOM

RECORD SHEET **HP/M--** Page No. **7.5**

Title	**HP HEATER CONNECTION FLANGE MEASUREMENTS**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**13/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by CFS	Date 8/3/03	Supervisor		Date	Approved	Date	9/3/03







All measurements to be taken at circumferential positions, to find minimum and maximum readings.

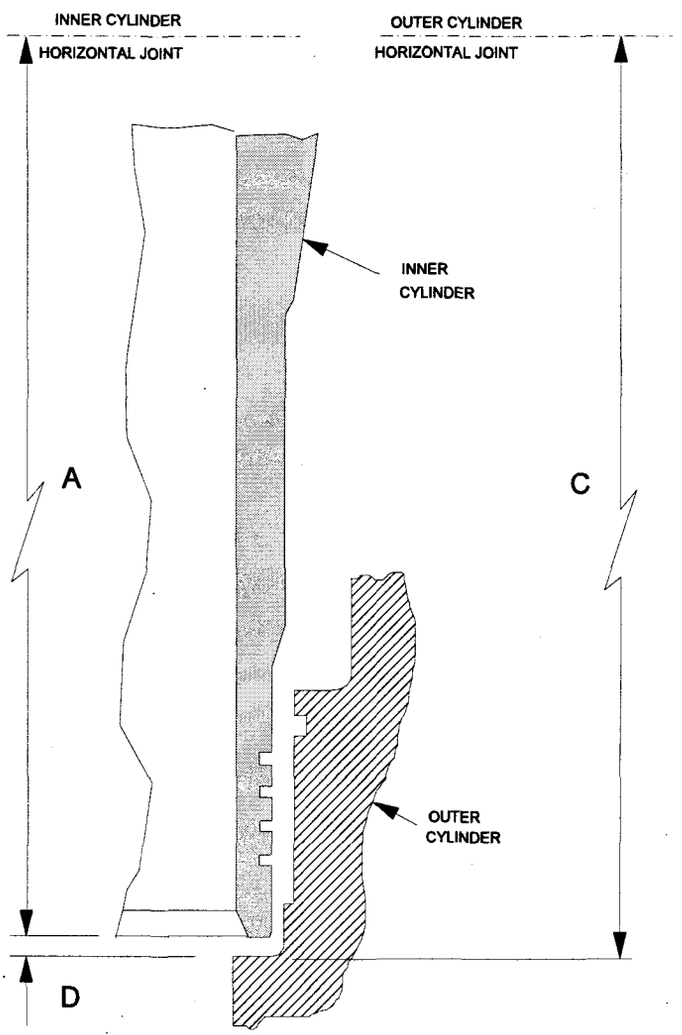
Readings in inches

POSITION	A	B	C	D	E	F	G
MIN	**12.374**	**12.374**	**12.900**	**12.386**	**4.075**	**0.642**	**0.778**
MAX	**12.3745**	**12.3745**	**12.902**	**12.386**	**4.076**	**0.642**	**0.778**

ALSTOM

RECORD SHEET **HP/M16A** Page No. **7.6**

Title	**HP BOTTOM INLET PIPE END CLEARANCE MEASUREMENTS**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**13/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by GMcNeil/MLS	Date 6/3/03	Supervisor		Date	Approved	WTBalcomy	Date 7/3/03



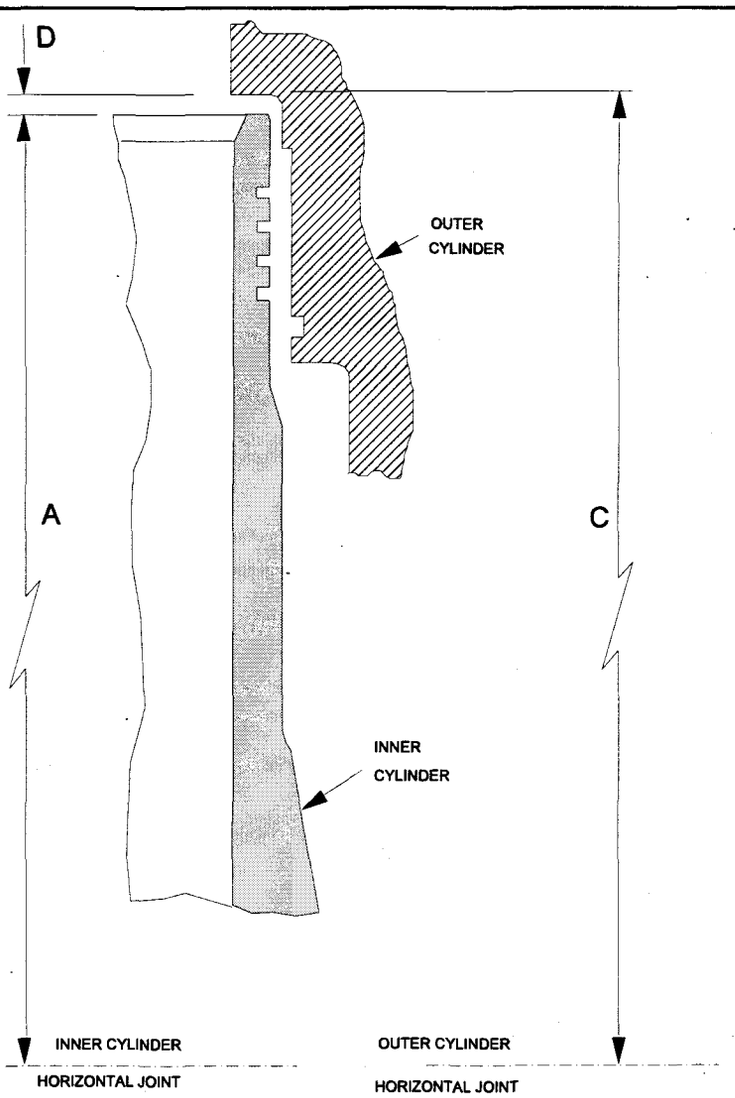
Readings in inches

POSITION	A	C (FARO)	D= (C - A)
BOTTOM LHS	64.567	64.897	**0.330**
BOTTOM RHS	64.567	64.904	**0.337**

ALSTOM

RECORD SHEET **HP/M16** Page No. **7.7**

Title	**HP TOP INLET PIPE END CLEARANCE MEASUREMENTS**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**13/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by GMcNeil/MLS	Date 6/3/03	Supervisor		Date	Approved		Date 7/3/03



Readings in inches

POSITION	A	C (FARO)	D= (C - A)
TOP LHS	64.625	64.939	**0.314**
TOP RHS	64.625	64.937	**0.312**

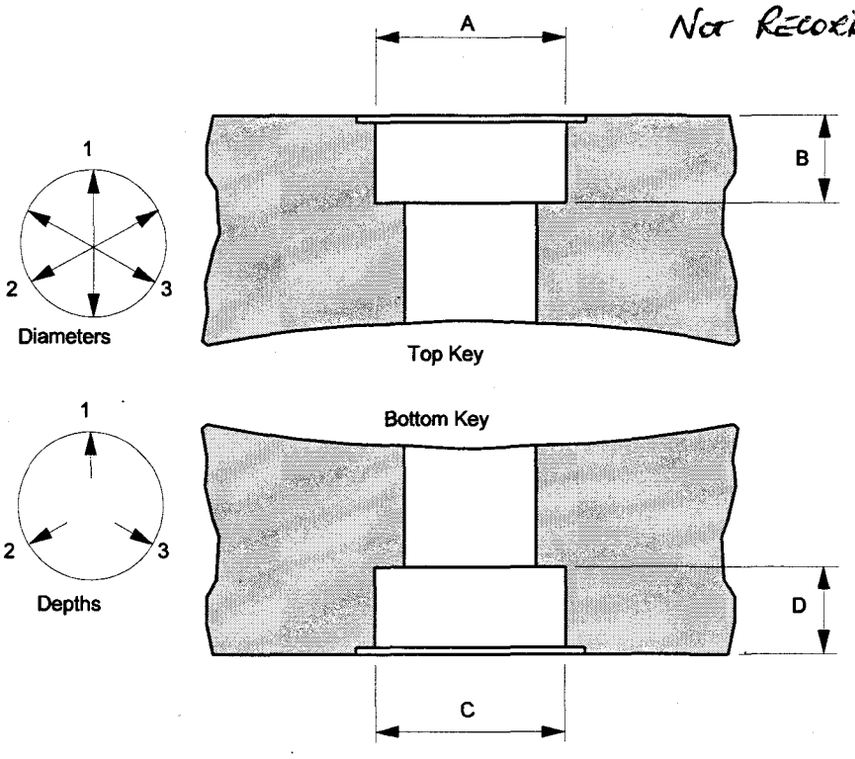
ALSTOM

RECORD SHEET **HP/M8** Page No. **7.8**

Title **HP INNER CYLINDER FRONT TRANSVERSE LOCATION KEYS - OUTER CYLINDER MEASUREMENTS**

Contract	INTERMOUNTAIN		Unit No.	1	Serial No.	11246
Site Issue	A	Date 13/02/02	Checked	BI	Check List No.	1175
Taken by	Date	Supervisor	Date	Approved		Date

Not Recorded



BOTTOM KEY DIFFERENT ARRANGEMENT

Readings in inches

TOP KEY	POSITION	1	2	3
	A			
	B			

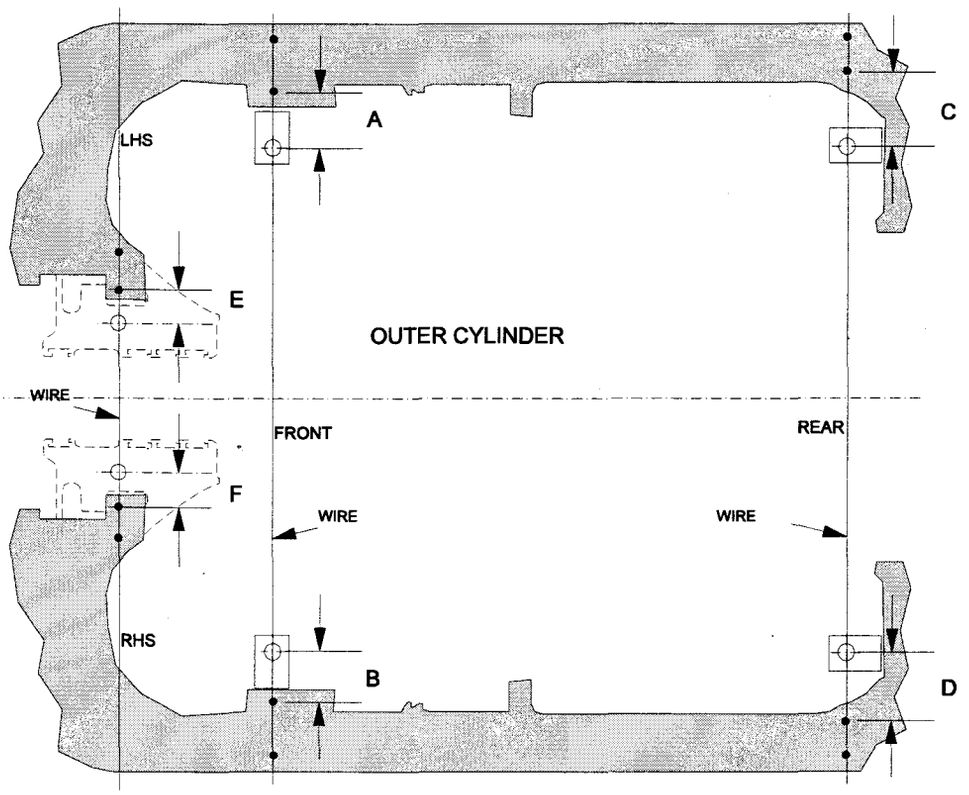
OLD TOP INSERT	POSITION	1	2	3
	C	**N/A**		

ALSTOM

RECORD SHEET **HP/M7** Page No. **7.9**

Title	**HP INNER CYLINDER HD BOLTS - OUTER CYL. MEASUREMENTS**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**13/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by	Date	Supervisor		Date	Approved		Date

CHECKSHEET NOT USED. RELOCATED HOLES MARKED OUT FROM NEW INNER CASING



USE WIRE TO ESTABLISH C/L OF BOLTS THEN SCRIBE LINES TO OUTER HALF JOINT AND CENTRE POP FOR STRAIGHT EDGE ALIGNMENT.
CENTRE POP MARK FOR MEASUREMENT TO C/L HOLE.

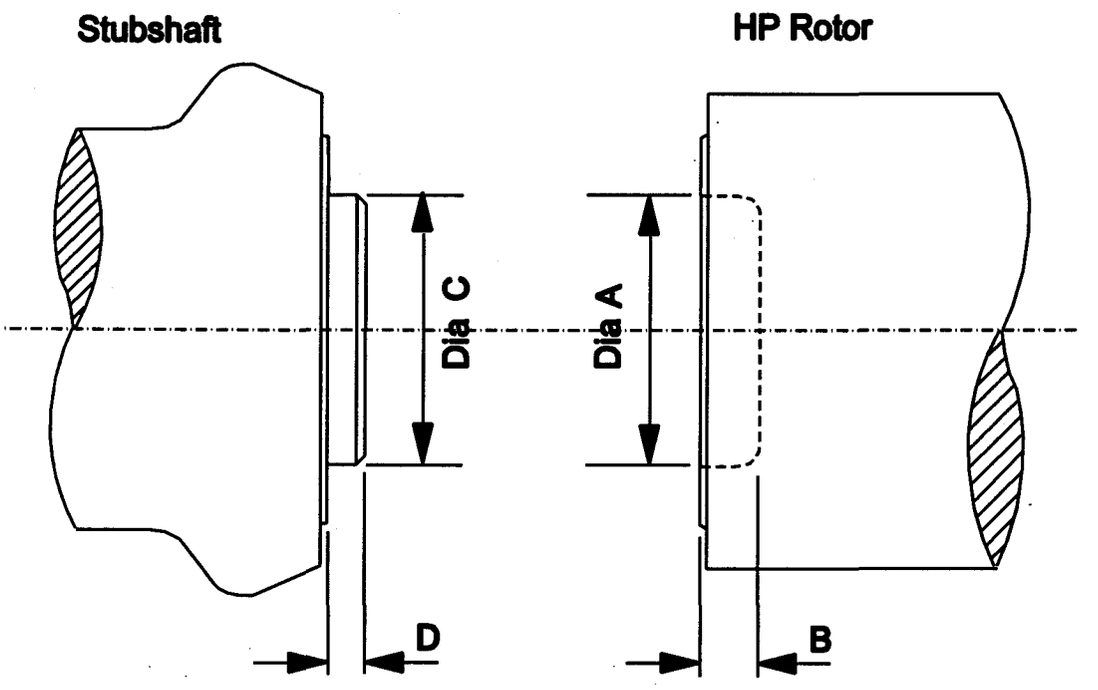
Readings in inches

LHS	**E**	**A**	**C**
	N/A		
RHS	**F**	**B**	**D**
	N/A		

ALSTOM

RECORD SHEET **HP/M13** Page No. **7.10**

Title	**HP STUBSHAFT SPIGOT MEASUREMENTS (PRIOR TO MACHINING)**						
Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**13/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by CFS	Date 11/3/03	Supervisor		Date	Approved	Date	11/3/03



Readings in inches

A		B	C		D
0°	90°		0°	90°	
6.999	**6.999**	**0.661**	**6.9995**	**6.9995**	**0.500**

ALSTOM

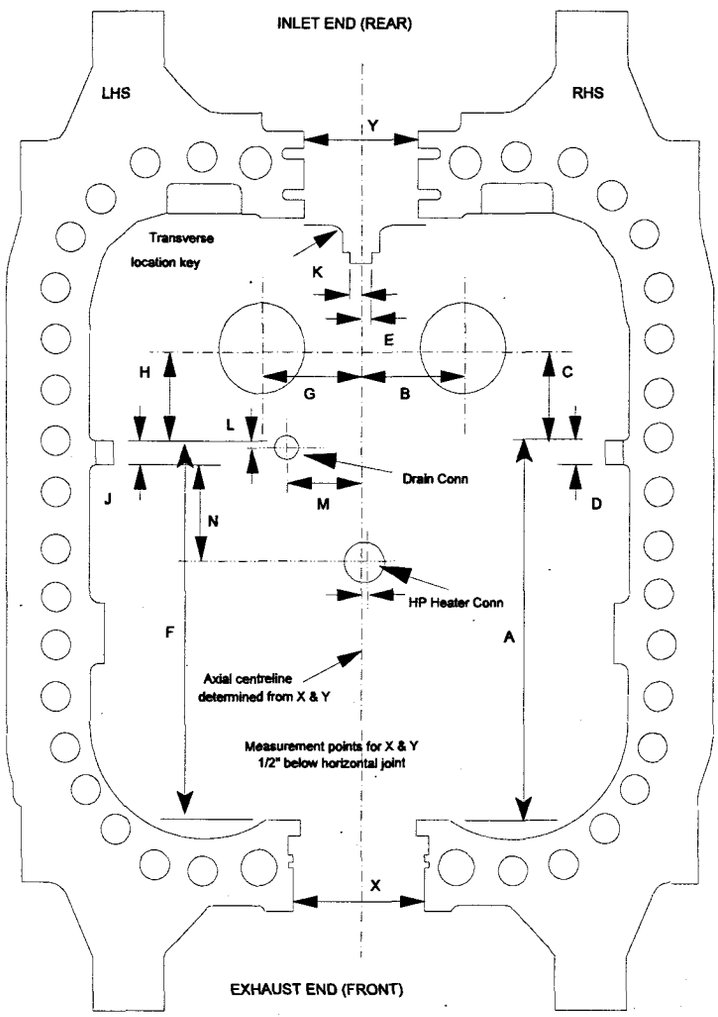
RECORD SHEET **HP/M15** **Sheet 1 of 3** Page No. **7.11**

Title **HP BOTTOM HALF OUTER CYLINDER MEASUREMENTS**

Contract	**INTERMOUNTAIN**	Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**5/3/03**	Checked	**WHF**	Check List No.	**1175**

Taken by G McNeil Date 6/3/03 Supervisor Date Approved Date 6/3/03

NOTE:- FOR FARO ARM MEASUREMENTS. THE INLET CONNECTIONS ARE VIEWED FROM THE TOP.
IE. THE LHS AND RHS ARE AS SHOWN



Readings in inches

POSITION RHS	A	B	C	D	E
	76.695	13.365	24.050	3.490	1.725
POSITION LHS	F	G	H	J	K
	76.740	13.383	23.989	3.485	1.755
	L	M	N	P	
	13.530	6.727	32.211	0.028	

REAR	Y
FRONT	X

Note: **P** is left of the centreline

ALSTOM

RECORD SHEET **HP/M15** **Sheet 2 of 3** Page No. **7.12**

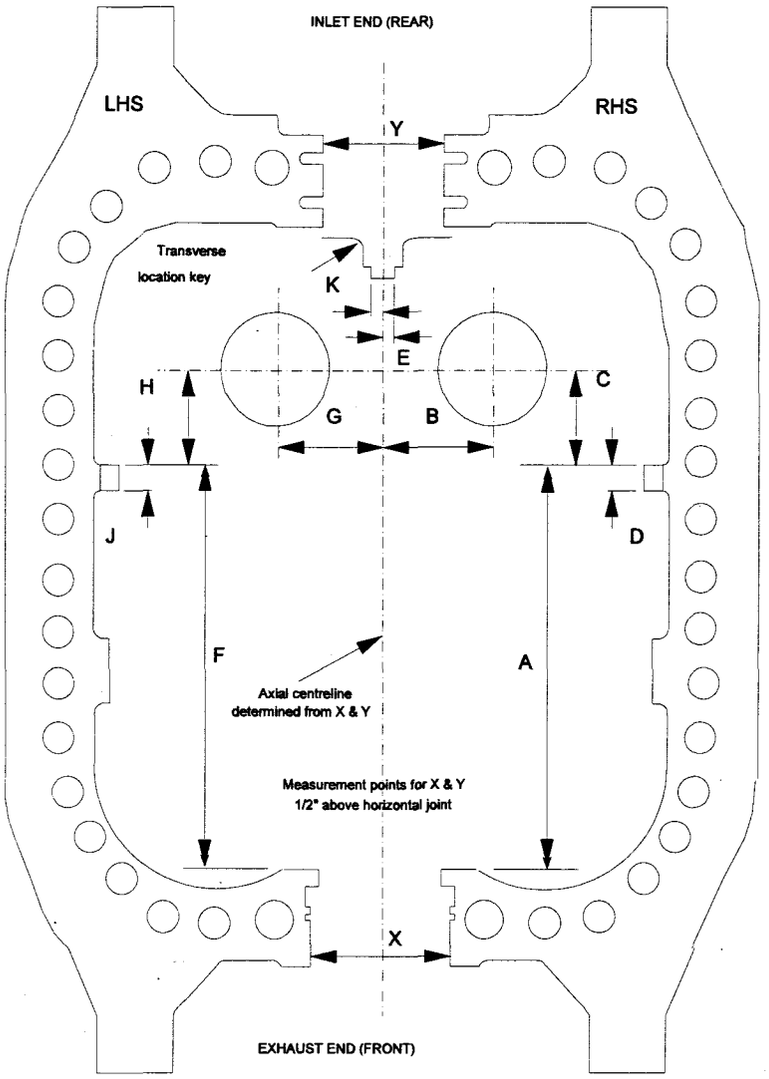
Title **HP TOP HALF OUTER CYLINDER MEASUREMENTS**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **5/3/03** Checked **WHF** Check List No. **1175**

Taken by G McNeil Date 6/3/03 Supervisor Date Approved i.H.Jakeman Date 6/3/03

NOTE:- FOR FARO ARM MEASUREMENTS. THE INLET CONNECTIONS ARE VIEWED FROM THE TOP. IE. THE LHS AND RHS ARE AS SHOWN



Readings in inches

POSITION RHS	A	B	C	D	E
	76.746	13.374	24.028	3.491	1.745
POSITION LHS	F	G	H	J	K
	76.755	13.378	24.021	3.491	1.747

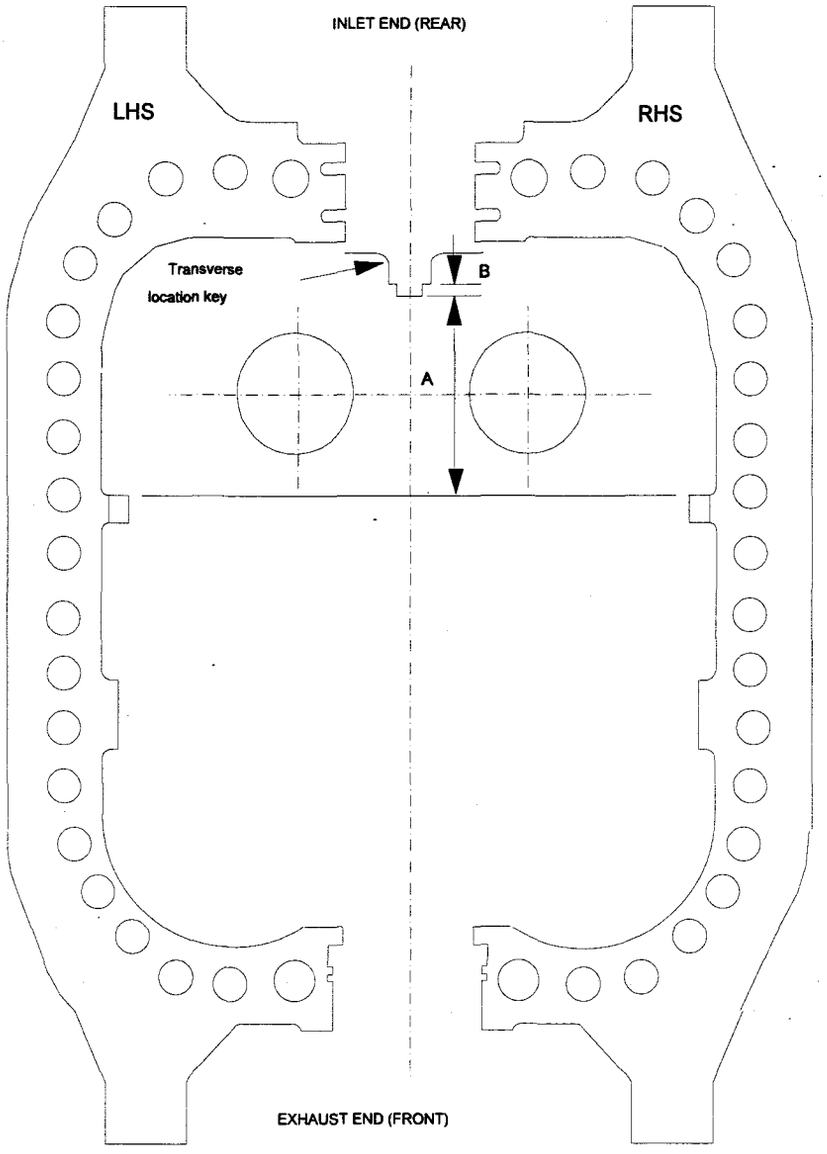
REAR	Y
FRONT	X

ALSTOM

RECORD SHEET **HP/M15** **Sheet 3 of 3** Page No. **7.13**

Title **HP OUTER CYLINDER REAR TRANSVERSE KEY MEASUREMENTS**

Contract	**INTERMOUNTAIN**			Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**7/3/02**	Checked	**BI**	Check List No.	**1175**
Taken by G McNeil	Date 6/3/03	Supervisor		Date		Approved	Date 6/3/03



Readings in inches

POSITION	BOTTOM HALF INNER CYLINDER		TOP HALF INNER CYLINDER	
	A	**B**	**A**	**B**
	59.147	1.701	59.170	1.705

ALSTOM

QC 001

CHECK SHEET ISSUE STATUS AND COMPLETION RECORD

CONTRACT **INTERMOUNTAIN** UNIT NO: **1** ST NO: **11246**

CHECKLIST NO: **1175**

SECTION NO: **8** TITLE: **COUPLINGS - REBUILD** Sheet 1 of 1

PAGE NO	RECORD SHT NO	DESCRIPTION	ISSUE	TS ENGR
8.1	CP01/002	HP / IP Rotor alignment - shell weight off	A	
8.2	CP01/002	HP / IP Rotor alignment - shell weight on	A	
8.3/8.5	CP02/001	HP/IP Coupled rotors concentricity	A	
8.6	CP03/003	Coupling bolt/sleeve data (Hydraulic bolts)	A	
8.7	CP04/003	Hydraulic coupling bolt tightening checks and stretch	A	
8.8	CP02/005	HP rotor to control shaft concentricity checks	A	

ALSTOM

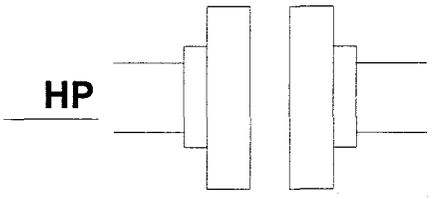
RECORD SHEET **CP01/002** Page No. **8.1**

Title **ROTOR COUPLING ALIGNMENT - HP/IP - WEIGHT OFF**

Contract	**INTERMOUNTAIN**	Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**15/2/02**	Checked	**BI**	Check List No.	**1175**
Taken by	Date	Supervisor	Date	Approved	Date

WEIGHT OFF ALIGNMENT NOT RECORDED

ROTOR 'A'
BRIDGE GAUGE
READING = N/A

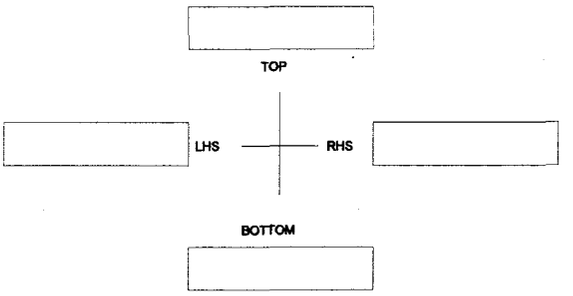


ROTOR 'B'
BRIDGE GAUGE
READING = N/A

ALL READINGS WITH COUPLING DATUMS IN LINE TURNING BOTH ROTORS TOGETHER

COUPLING PERIPHERY ALIGNMENT
(AXES ALIGNMENT)

*** CLOCK/FINGER** MOUNTED
ON ____ COUPLING (* DELETE AS REQUIRED)

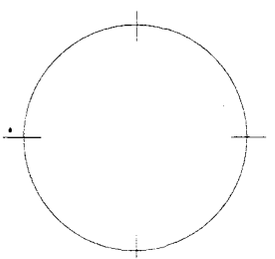


READINGS ARE INCH
COUPLING GAP
(ANGULAR ALIGNMENT)

	LHS	TOP	RHS	BOTTOM (CALC)
0°				
90°				
180°				
270°				
TOTAL				
AVERAGE				

READINGS ARE INCH

AVERAGE GAP



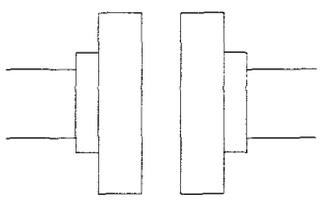
ALSTOM

RECORD SHEET **CP01/002** Page No. **8.2**

Title **ROTOR COUPLING ALIGNMENT - HP/IP - WEIGHT ON**

Contract	**INTERMOUNTAIN**	Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date **15/2/02**	Checked	**BI**	Check List No. **1175**
Taken by IPSC	Date 25/3/03	Supervisor	Date	Approved	Date 25/3/03

ROTOR 'A' BRIDGE GAUGE READING = **HP**



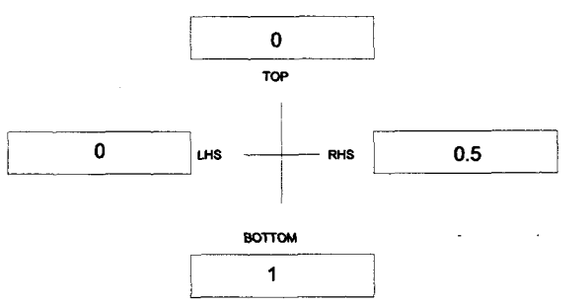
IP

ROTOR 'B' BRIDGE GAUGE READING =

ALL READINGS WITH COUPLING DATUMS IN LINE TURNING BOTH ROTORS TOGETHER

COUPLING PERIPHERY ALIGNMENT
(AXES ALIGNMENT)

CLOCK MOUNTED
ON **IP** COUPLING

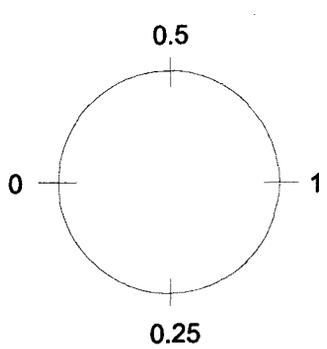


READING ARE INCH
COUPLING GAP
(ANGULAR ALIGNMENT)

	LHS	TOP	RHS	BOTTOM (CALC)
0°	140.0	140.0	141.0	140.0
90°	139.5	141.0	141.0	140.0
180°	142.0	143.0	143.5	142.5
270°	145.0	144.5	145.0	145.0
TOTAL	566.5	568.5	570.5	567.5
AVERAGE	141.63	142.13	142.63	141.88

READING ARE INCH *

AVERAGE GAP



8 - COUPLINGS - REBUILD

ALSTOM

RECORD SHEET **CP02/001** Page No. **8.3**

Title **HP/IP COUPLED ROTORS CONCENTRICITY**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **15/2/02** Checked **BI** Check List No. **1175**

Taken by MLS Date 14/3/03 Supervisor MLS Date 14/3/03 Approved [signature] Date 15/3/03

4 SLAVE BOLTS

PRIOR TO LINE BORE

ALL READINGS ARE 0.0001" RUN 'A'

ANGULAR POSITION DEGREES/BOLT HOLES	ROTOR [HP]			ROTOR [IP]		CALCULATION			
	JOURNAL (Ja)	COUPLING (Ca)		COUPLING (Cb)	JOURNAL (Jb)	Ja -Jb		Ca - Cb	
0°	34	20		26	29	5.0	-------	-6.0	-------
45°	34	20		26	30	4.0	-------	-6.0	-------
90°	36	21		25	30	6.0	-------	-4.0	-------
135°	37	24		26	28.5	8.5	-------	-2.0	-------
180°	36.5	31		25	28	8.5	1.8	6.0	6.0
225°	36.5	33		26	29	7.5	1.8	7.0	6.5
270°	35	31		25.5	29	6.0	0.0	5.5	4.8
315°	34	25.5		26	28.5	5.5	1.8	-0.5	0.8
360°	35	20		26	29.5	5.5		-6.0	

CONCENTRICITY ERROR = 1/2 MAX. DIFFERENCE OF PAIRS OF JOURNAL/COUPLING READINGS 180° APART.

JOURNAL CONCENTRICITY ERROR = 1.8 X .0001"

COUPLING CONCENTRICITY ERROR = 6.5 X .0001"

ALSTOM

RECORD SHEET **CP02/001** Page No. **8.4**

Title **HP/IP COUPLED ROTORS CONCENTRICITY**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **15/2/02** Checked **BI** Check List No. **1175**

Taken by RO(CFS)MLS Date 14/3/03 Supervisor MLS Date14/3/03 Approved [signature] Date 15/3/03

4 RADIAL FIT BOLTS EXPANDED AND STRETCHED

ALL READINGS ARE 0.0001"

ANGULAR POSITION DEGREES/BOLT HOLES	ROTOR [HP]			ROTOR [IP]		CALCULATION			
	JOURNAL (Ja)	COUPLING (Ca)		COUPLING (Cb)	JOURNAL (Jb)	Ja -Jb		Ca - Cb	
0°	30	28.5		33	29	1.0	-------	-4.5	-------
45°	30	25.5		33	30	0.0	-------	-7.5	-------
90°	30	25.5		33	28	2.0	-------	-7.5	-------
135°	30	25.5		33.5	26	4.0	-------	-8.0	-------
180°	30.5	27		32	25.5	5.0	2.0	-5.0	0.3
225°	30.5	28.5		31.5	26	4.5	2.3	-3.0	2.5
270°	30	29		30.5	26.5	3.5	0.8	-1.5	3.0
315°	30	29		32.5	27	3.0	0.5	-3.5	2.3
360°	30	28		33	28.5	0.5		-5.0	

CONCENTRICITY ERROR = 1/2 MAX. DIFFERENCE OF PAIRS OF JOURNAL/COUPLING READINGS 180° APART.

JOURNAL CONCENTRICITY ERROR = 2.3 X .0001"

COUPLING CONCENTRICITY ERROR = 3.0 X .0001"

ALSTOM

RECORD SHEET **CP02/001** Page No. **8.5**

Title **HP/IP COUPLED ROTORS CONCENTRICITY**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **15/2/02** Checked **BI** Check List No. **1175**

Taken by IPSC Date 26/3/03 Supervisor Date Approved [signature] Date 26/3/03

ALL BOLTS FITTED AND STRETCHED

ALL READINGS ARE 0.0001"

ANGULAR POSITION DEGREES/BOLT HOLES	ROTOR [HP]			ROTOR [IP]		CALCULATION			
	JOURNAL (Ja)	COUPLING (Ca)		COUPLING (Cb)	JOURNAL (Jb)	Ja -Jb		Ca - Cb	
0°	0	0		0	0	0.0	-------	0.0	-------
45°	6	3		1	7	-1.0	-------	2.0	-------
90°	10	9		4	7	3.0	-------	5.0	-------
135°	8	5		6	1	7.0	-------	-1.0	-------
180°	4	1		6	-6	10.0	-5.0	-5.0	2.5
225°	-3	-6		6	-11	8.0	-4.5	-12.0	7.0
270°	-1	-5		0	-6	5.0	-1.0	-5.0	5.0
315°	2	-1		0	0	2.0	2.5	-1.0	0.0
360°	0	0		0	0				

CONCENTRICITY ERROR = 1/2 MAX. DIFFERENCE OF PAIRS OF JOURNAL/COUPLING READINGS 180° APART.

JOURNAL CONCENTRICITY ERROR = 5 X .0001"

COUPLING CONCENTRICITY ERROR = 7 X .0001"

ALSTOM

RECORD SHEET **CP03/003** Page No. **8.6**

Title **COUPLING BOLT/SLEEVE DATA (HYDRAULIC BOLTS)**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **13/02/02** Checked **BI** Check List No. **1175**

Taken by Steve CFS Date March 03 Supervisor Date Approved Date 25/3/03

COUPLING HP / IP

NOMINAL BOLT SIZE

Readings in inches

HOLE I.D.		BOLT HOLE FINAL SIZE			SLEEVE DIAMETER (MEAN)	DIAMETRAL CLEARANCE	
HP COUPLING	ORIGINAL HP ROTOR	MIN	MAX	MEAN		MIN	MAX
1	-	2.599	2.599	2.599	2.5963	0.0027	0.0027
2	-	2.5993	2.5993	2.5993	2.5965	0.0028	0.0028
3	-	2.5988	2.5988	2.5988	2.5965	0.0023	0.0023
4	-	2.5985	2.5985	2.5985	2.5960	0.0023	0.0023
5	-	2.5982	2.5982	2.5982	2.5957	0.0025	0.0025
6	-	2.599	2.599	2.599	2.5965	0.0025	0.0025
7	-	2.5989	2.5989	2.5989	2.5964	0.0025	0.0025
8	-	2.5982	2.5982	2.5982	2.5957	0.0025	0.0025
9	-	2.5995	2.5995	2.5995	2.5970	0.0025	0.0025
10	-	2.5995	2.5995	2.5995	2.5970	0.0025	0.0025
11	-	2.5983	2.5983	2.5983	2.5956	0.0027	0.0027
12	-	2.5985	2.5985	2.5985	2.5960	0.0025	0.0025
13	-	2.5985	2.5985	2.5985	2.5962	0.0023	0.0023
14	-	2.5985	2.5985	2.5985	2.5961	0.0024	0.0024
					SLEEVE DES CLRC = .0023/.0035		

ALSTOM

RECORD SHEET **CP04/003** Page No. **8.7**

Title **HYDRAULIC COUPLING BOLT TIGHTENING CHECKS AND STRETCH**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **13/02/02** Checked **BI** Check List No. **1175**

Taken by Date Supervisor Date Approved WHF Date

COUPLING HP / IP

EXPANSION PRESS.= **TENSIONING PRESS.=** **NOMINAL BOLT SIZE = 2.6"**

Readings in inches

BOLT NO.	BOLT TIGHTENING CHECKS				BOLT EXTENSION		
	SLEEVE EXPANDED	FRONT NUT TIGHTENED	FRONT NUT RETIGHTENED	REAR NUT TIGHTENED	BOLT FREE LENGTH	TIGHTENED LENGTH	BOLT EXTENSION
1	RECORDS HELD BY IPSC / MD & A						
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

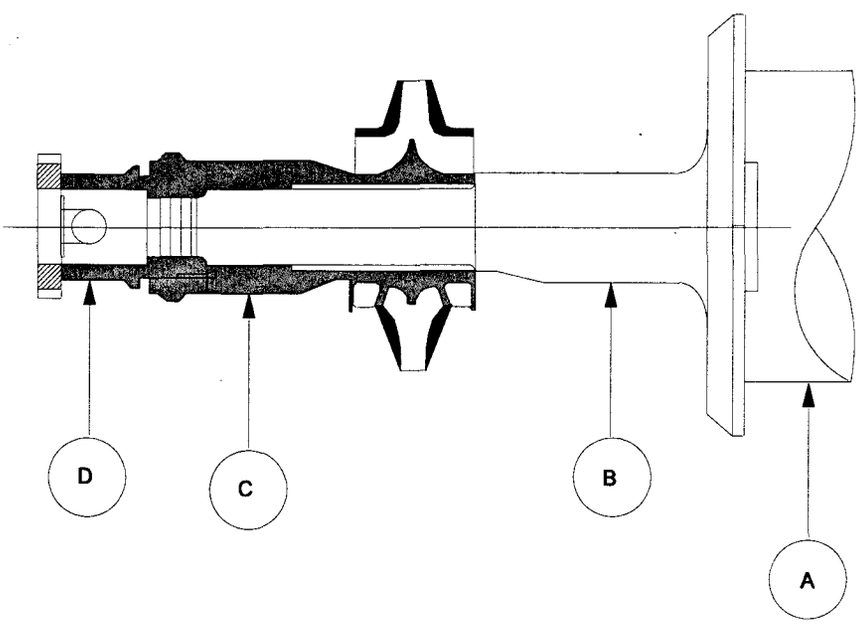
ALSTOM

RECORD SHEET **CP02/005** Page No. **8.8**

Title **HP ROTOR STUBSHAFT CONCENTRICITY CHECKS**

Contract	**INTERMOUNTIAN**	Unit No.	**1**	Serial No.	**11246**
Site Issue	**A**	Date	**13/02/02**	Checked	**BI**	Check List No.	**1175**
Taken by	Date	Supervisor	Date	Approved	WHF	Date	

MAIN OIL PUMP HP ROTOR



Readings are 0.0001"

ANGLE POSITION DEG	INDICATOR CLOCK READINGS				
	CLOCK 'D'	CLOCK 'C'	CLOCK 'B'	CLOCK "A"	C - A
0	Records held by IPSC / MD & A				
45					
90					
135					
180					
225					
270					
315					
360					

MAXIMUM CONCENTRICITY ERROR =